

Asia Pacific Journal of Health Management

Volume 20 Issue 3 2025

The Journal of ACHSM & SHAPE



PRESIDENT COLUMN

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Elizabeth Koff AM

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Dr Mark Avery

Editor-in-Chief, Asia Pacific Journal of Health Management

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WELCOME TO THE FINAL ISSUE OF THE COLLEGE'S ASIA PACIFIC JOURNAL OF HEALTH MANAGEMENT FOR 2025

Elizabeth Koff AM

President of Australasian College of Health Service Management



The College strives to ensure we support our College members in their leadership journey and this academic journal is an important element of this support. Firstly, my thanks to Mark Avery, the College Chief Editor and to Yaping Liu, our Librarian and journal production editor for the work they do to bring you the journal.

At this time of year it is time to consider what we have achieved over the past year and to look forward with anticipation to the coming year. During 2025 the College has experienced significant momentum with 220 new members joining the College. We welcomed over 200 people to our annual conference in Melbourne in March and in a first for the College, we sold out our Annual Asia-Pacific Congress in late October. Commiserations to those of you who missed out on the 2025 Congress and I recommend you book early for the next Congress to be held in Cairns 28-30 October 2026. Many of the articles in this issue come from key presentations made at the Congress in Darwin.

We also developed more substantial professional development programs in 2025 and you can expect that to continue with new programs coming online and in person in 2026. The College has also partnered with the Australian Institute of Company Directors for them to conduct their renowned Company Directors Course for our members commencing towards the end of February 2026.

This year we welcomed 40 new Fellows of the College and more than 80 members enrolled to attain the Certified Health Manager credential, a great way to signal to colleagues your commitment to your profession and lifelong learning.

Thank you, too, to Dr Neale Fong, whose hard work as President has been integral to the growth of the College in the past few years and my appreciation for his continuing to support the College as Vice President going forward.

Finally, a wish to all of you for a safe and happy Festive Season.

Elizabeth Koff AM

President of Australasian College of Health Service Management

BOUNDARY-SPANNING LEADERSHIP

Dr Mark Avery

Editor-in-Chief, Asia Pacific Journal of Health Management

The complexity of service organisation and delivery provides an ongoing opportunity for health, aged and social care leaders to frame and engage in interagency and inter-organisation working. In considering a 'boundary-spanning' approach, it is possible to capitalise on active working across organisational, professional sector or disciplinary boundaries with the objective of enabling co-ordination and joint action. A perspective is for leaders acting as stewards (rather than managers of organisations) for shared outcomes where success is measured by relational capital and holding constructive tension rather than control of compliance.

Several approaches to leading and managing across separately owned and governed organisations [1, 2] identify processes and behavioural considerations. Structured collaborative governance provides useful and, in some cases, necessary forums, rules and mandated approaches to leading and managing. Boundary-spanning can be active in establishing priorities and urgency in translating priorities, broker compromise and enable momentum. This is a useful approach in health given that action outcomes can depend on autonomous actors rather than hierarchical controls. There does not need to be a 'right way' for dynamic collaboration and different approaches or models of engagement and working may be transferred across and into different parts of the health care continuum [3].

The leadership process (setting vision, engaging with stakeholders) provides for an engagement for impact in interagency working. Key success factors for engagement and impact across organisational boundaries involve: shared purpose and outcomes alignment; trust-based relationships and governance; and enabling systems and capability. Agreeing and articulating shared purpose and alignment for outcomes gives a unifying narrative to support for collective system value. Trust-based working [4], particularly in relation to distributed authority and professional autonomy provides for sharing and constructive challenge and risk taking. Enabling systems and capabilities provide for translation of intent to action.

Engaging in interagency leadership and working in a boundary-spanning context provides for attention and impact on the pivotal challenges in the sectors of access, equity, workforce sustainability and patient flow. This approach is an opportunity to move beyond formal authority to capitalise on credibility and shared intent.

In this issue several valuable papers have been submitted from two conferences held in 2025:

SHAPE (Society for Health Administration Programs in Education) International Symposium 2025

2025 Symposium held in Hybrid Mode from Singapore – 30th June – 2nd July 2025

Annual Symposium Supporting health management practice, education, and research in the ever-changing environment.

Papers invited from presenters at the symposium are included in this issue.

The June/July symposium focused on key issues associated with value-based healthcare; artificial intelligence in health; changes in health systems and models of care; and also, innovations in health service delivery, management and education.

<https://www.shape.org.au/about-shape>

ACHSM (Australasian College of Health Service Management) – 2025 ACHSM Congress
ACHSM Asia-Pacific health leadership congress held in Darwin – 22-24 October 2025
Australasia's premier gathering of healthcare leaders and decision-makers

Papers invited from presenters at the symposium are included in this issue.

The congress emphasised health leadership in complexity: workforce sustainability, First Nations partnership, remote and regional equity, climate and planetary health, digital transformation and governance capability. Key learning highlighted adaptive leadership, co-design with communities, data-informed decision-making and collaboration across sectors to deliver resilient, value-based health systems nationally and globally.

<https://www.achsm.org.au/>

Mark Avery
Editor-in-Chief

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IMPLEMENTING ELECTRONIC HEALTH RECORDS IN COMMUNITY PHARMACY PRACTICE: INSIGHTS FROM DEVELOPED HEALTH SYSTEMS

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ABSTRACT

Community pharmacists play a critical role in medication management, patient education, and chronic disease support. Yet their ability to provide safe, coordinated, and efficient care is often hindered by limited access to essential clinical information such as medication histories, allergy records, laboratory results, and chronic condition details. Electronic Health Records (EHRs), comprehensive digital systems that enable information sharing across healthcare providers, offer a promising solution. This analysis explores how EHRs can empower community pharmacists to deliver more informed, integrated, and patient-centred care. It also identifies key barriers to pharmacist engagement, including restricted system access, fragmented digital infrastructure, limited interoperability, and insufficient training in digital health tools. To address these challenges, system-level reforms are needed such as investment in digital connectivity, policy changes to formally recognise pharmacists as core members of multidisciplinary care teams, and practical strategies for EHR integration into community pharmacy practice.

KEYWORDS

Community pharmacy, Electronic health records (EHR), Medication reconciliation, Digital health, Care transitions, Health information exchange (HIE)

INTRODUCTION

Community pharmacists are among the most accessible healthcare providers, with the potential to significantly influence patient health-related outcomes [1, 2]. However, their clinical impact is often limited by inadequate access to comprehensive digital health records. Evidence shows that when pharmacists have access to the same comprehensive health records as the rest of the healthcare team (i.e., nurses, medical practitioners), the quality of care improves [3, 4]. Studies consistently highlight that EHR integration in pharmacy systems leads to better medication safety, improved continuity of care, and increased efficiency in healthcare delivery [3, 5, 6].

This commentary critically examines the current state of electronic health record (EHR) use in community pharmacy practice, drawing on international experience and selected evidence to explore key barriers, enablers, and policy considerations. Its purpose is to stimulate reflection on how EHR integration can support the evolving clinical role of pharmacists and inform future directions for system-level reform. While not intended as a systematic review, this commentary is informed by a narrative synthesis of relevant empirical studies and policy literature to explore the practical, systemic, and professional factors influencing EHR implementation in community pharmacy.

While we focus on developed health systems, it is important to acknowledge the contrasting realities in lower-resource Southeast Asian countries. A systematic review identifies a growing role for community pharmacists in public health initiatives across countries such as Indonesia, the Philippines, Vietnam, and Cambodia [7]. These services include smoking cessation, health promotion, and screening for infectious diseases. However, pharmacist integration into national health systems remains limited, and formal documentation systems are often absent or inconsistent [7]. In Indonesia specifically, despite government initiatives that aim to expand the pharmacist's role in primary care, the adoption of EHR in community pharmacies is extremely limited [8]. This study describes multi-level barriers to EHR implementation, including policy and regulatory gaps (macro-level), weak information-sharing systems (meso-level), and limited pharmacist training in digital tools (micro-level) [8]. Together, these structural issues contribute to the digital divide between resource-constrained and high-income pharmacy systems.

COMMUNICATION BARRIERS AND HOW EHRS HELP

Traditional communication methods, such as phone calls, text messages, and faxes, can disrupt workflow, inundate the workplace with paper, hinder information sharing among healthcare professionals, and subsequently delay timely patient treatment [9]. Instead of a fully integrated care ecosystem, many community pharmacies remain digitally siloed. This isolation prevents timely communication between pharmacists, physicians, and hospitals hindering transitions of care and medication reconciliation efforts.

Current technology and informatics can be utilised to address such challenges. EHRS aim to streamline various components of the healthcare system to improve overall safety, efficiency, and effectiveness [10]. For community pharmacists, EHR integration enables more informed clinical decision-making through access to comprehensive medical histories. This includes selecting appropriate medications, adjusting dosages, recommending alternatives, and offering personalised counselling based on real-time data [5].

EHR access also strengthens interprofessional collaboration by enabling pharmacists and prescribers to coordinate care using real-time clinical data such as laboratory results, medication histories, and discharge summaries which helps reduce medication errors [3, 5]. Studies have demonstrated that when pharmacists gain access to medical records in community pharmacy settings, they are able to make timely clinical interventions, improve adherence to clinical guidelines, and enhance communication with prescribers [11]. Evidence also suggests that pharmacist participation in health information exchange platforms, supported by targeted training and system integration, further enhances the safety and effectiveness of medication management [12]. Collectively, these findings align with broader literature showing that shared access to patient data facilitates collaborative decision-making, reduces duplication of therapies, and improves

overall care coordination in both rural and urban contexts [3, 11, 12]. Importantly, it broadens pharmacists' roles beyond dispensing. With access to laboratory results, such as renal and liver function tests, pharmacists can evaluate therapy suitability, detect contraindications, and make clinical recommendations particularly for patients with chronic illnesses. These capabilities support the evolving role of community pharmacists as integral members of the healthcare team and contribute to safer, more effective medication management [3, 9].

MODELS OF COMMUNITY PHARMACIST ACCESS TO EHRs

Community pharmacists' access to EHRs varies considerably across countries, both in terms of system design and level of access. A useful way to compare these international models is by the degree of pharmacist access: two-way (read-write), read-only, or fragmented. A comparative summary of pharmacist EHR access models across Australia, the UK, and the US is presented in Appendix Table 1.

In Australia, the My Health Record (MyHR) system which is governed by the Australian Digital Health Agency and offers patients control over access to their health information provides community pharmacists with two-way access, allowing them not only to view but also to contribute information such as dispense records. Community pharmacists have been permitted to view and contribute to this national system [5]. Pharmacists can access clinical documents including pathology reports, immunisation histories, discharge summaries, and imaging results. This level of integration supports a broader clinical role in chronic disease management, medication reviews, and public health services [6]. However, the system's effectiveness depends on contributions from multiple healthcare providers and patient consent, which can affect data completeness [6]. However, these capabilities have not yet been consistently realised in practice due to limited engagement by providers, technical integration issues, and incomplete data factors [13, 14].

In the United Kingdom, the National Health Service (NHS) Summary Care Record (SCR) has provided community pharmacists with read-only access since 2015 [6]. Unlike Australia's broader model, the SCR draws primarily from general practice records and includes essential information such as prescribed medications and allergy histories. Though more limited in scope, the SCR has proven valuable in clinical, including urgent and emergency care, where its use has been associated with improved medication reconciliation and enhanced patient safety [15]. While the SCR offers clear benefits for emergency supply and medication reconciliation, its limited scope excluding lab results or clinical notes and lack of write access restrict pharmacists' ability to contribute to or act on broader clinical information [6]. These limitations, alongside integration and training barriers, have contributed to low uptake in routine pharmacy practice.

Similarly, community pharmacists with access to health information exchanges (HIEs) can support safer care transitions by reconciling hospital-initiated medication changes. In one United States-based study, integrating a health information exchange into a community pharmacy service enabled pharmacists to ensure that medication changes made during hospital stays were accurately followed when patients returned home reducing medication errors, and therapy gaps [16]. A 2023 evaluation of an HIE prototype reported moderate usability scores and identified several interface and integration barriers that disrupted pharmacy workflow [12]. In a 2022 mixed-methods study within the Community Pharmacy Enhanced Services Network, pharmacists acknowledged the potential of HIEs but noted that lack of seamless system integration, insufficient training, and workflow misalignment limited their routine use [17]. These findings suggest that while the value of HIEs in community pharmacy remains recognised, practical and contextual barriers continue to constrain widespread adoption.

These international examples highlight the value of EHR access for pharmacists, whether through fully interactive systems like MyHR or read-only records like the SCR. They also demonstrate that even partial access can enhance medication safety and support collaborative care. This is supported by both objective and subjective evidence where studies have shown that EHR access enables pharmacists to identify clinically significant medication discrepancies during transitions of care, while also improving workflow efficiency and confidence in clinical decision-making [18, 19]. As countries differ in EHR design and governance, these models offer important insights into how pharmacist access can be structured and

scaled. It is essential to recognise that the type and breadth of EHR data accessible to community pharmacists vary significantly across jurisdictions. In the United States, access remains fragmented while state-based tools such as Prescription Drug Monitoring Programs (PDMPs) and immunisation registries are widely used, there is no unified national EHR system providing pharmacists with comprehensive clinical information [17, 20]. By contrast, Australia's My Health Record offers two-way access to a wide range of clinical documents, while the UK's Summary Care Record provides more limited, read-only data such as current medications and allergy histories [6]. The effectiveness of EHR access depends not only on system availability but also on the scope, accuracy, and completeness of shared data particularly the inclusion of clinical notes, laboratory results, and discharge summaries. These contextual differences must be considered when evaluating the broader applicability and scalability of international EHR access models for pharmacy practice.

IMPLEMENTATION BARRIERS TO EHRS USE IN COMMUNITY PHARMACIES

Although not a formal implementation study, this commentary draws on key concepts from the Consolidated Framework for Implementation Research to inform its analysis [21]. Factors such as intervention complexity, organisational context, individual readiness, and external policy levers are considered in our discussion of barriers related to interoperability, workflow integration, reimbursement, and training.

Pharmacists often face restricted access to critical patient information. While pharmacists can utilise tools such as state-level Prescription Drug Monitoring Programs electronic databases used in the United States to monitor controlled substance prescriptions and identify potential misuse [20] and immunisation registries, these resources provide only a limited snapshot of a patient's health. Community pharmacists often lack access to essential data such as laboratory test results (important for monitoring drug safety), physician progress notes (which provide clinical context), and cross-pharmacy medication dispensing histories, which are crucial for assessing medication adherence and preventing medication duplication.

This information gap significantly limits pharmacists' ability to deliver optimised medication therapy management. For example, a study by Sethman et al. found that 100% of pharmacists would use a health information exchange (a secure electronic sharing of patient health information across different healthcare organisations to support coordinated care) if available, with 28.1% indicating they would use it for every patient [17]. Beyond therapy-related problems, limited access to health records also restricts pharmacists' capacity for early identification of adverse drug events, undermines contributions to pharmacovigilance activities, and hinders safe pharmacotherapeutic decision-making. Similarly, lack of access to medication dispensing histories is a known barrier to identifying therapy-related problems and delivering targeted interventions [22]. Improved data sharing across care settings supported by shared responsibility among all healthcare professionals is therefore essential.

In some countries, such as Australia, community pharmacists have access to national EHR systems, enabling them to monitor patient therapy [13]. However, this potential is often undermined by inconsistent use of the system and incomplete data entry across healthcare providers, including pharmacists themselves [14]. As a result, it remains difficult to obtain a comprehensive view of a patient's medical history, reducing the ability to assess treatment plans, avoid interactions, and support medication adherence [22].

Interoperability issues across healthcare settings including differences in clinical systems, digital infrastructure, and health IT platforms further exacerbate this problem. These limitations contribute to pharmacists' restricted access to patient records, thereby hindering seamless information exchange and coordinated care [23,24]. Many community pharmacy management systems are not fully integrated with the EHRs used by general practitioners, hospitals, or other healthcare facilities, limiting real time sharing of prescriptions, diagnosis and lab results [24]. Although systems like Australia's MyHR and the UK's SCR demonstrate that interoperability between pharmacies and broader healthcare systems is possible, such integration is not yet universal. Many community pharmacies remain digitally isolated, particularly where technical infrastructure, policy frameworks, or local system compatibility are lacking [24]. Many pharmacists report limited

functionality or incomplete data in EHR systems, stemming from inconsistent data entry, varying levels of engagement across provider groups, including pharmacy and persistent software limitations.

Non-updated or incomplete EHRs also pose serious risks to patient safety. A study conducted in Dutch community pharmacies revealed that interoperability issues led to missed drug therapy alerts due to incomplete electronic records. The study found that prescription drugs were missing from 14% of records, nonprescription drugs from 44%, comorbidities from 83%, and intolerances from 16% [25]. While these findings highlight the potential safety consequences of incomplete records, the Dutch context reflects a relatively mature but highly fragmented primary care EHR environment, where interoperability is influenced by decentralised data ownership and varied software vendors. Similar risks are likely to occur in other jurisdictions with fragmented systems unless consistent national data-sharing standards and sustainable funding models are established.

Many pharmacists face barriers related to reimbursement policies, time constraints, increased professional responsibilities, patient consent requirements, and liability concerns [13, 14]. Pharmacists also face personal and operational challenges. For example, some pharmacists express concern that EHR usage may disrupt dispensing workflows by introducing additional steps into daily operations [5]. Others feel underprepared to navigate these systems, citing a lack of confidence and formal training [6]. This under-preparedness can discourage the full integration of EHR usage into daily practice. Ownership structure may itself influence EHR implementation. In corporatised pharmacy settings, centralised IT infrastructure, access to technical support, and standardised workflows can significantly ease the rollout of digital systems. In contrast, independent pharmacy models often lack such infrastructure, which can impede adoption. A recent qualitative evaluation found that technology-enabled community pharmacies benefit from enhanced organisational support, suggesting that corporatised models may be better equipped to implement new ICT solutions effectively [26].

BENEFITS OF EHRS ACCESS IN COMMUNITY PHARMACY PRACTICE

While barriers to EHR uptake in community pharmacy are well-documented, several enablers operate at system, policy, organisational, and individual levels.

In Australia, most community pharmacists surveyed (90%) believed that access to a shared EHR system, such as MyHR, would enhance continuity of care, and over 70% indicated it would improve both the safety and quality of the care they provide. These findings, while drawn from a cross-sectional survey and therefore subject to potential response bias and limited generalisability [5], reinforce that when systems are aligned with pharmacy dispensing workflows and embedded into everyday practice, they reduce duplication, enhance medication safety, and facilitate coordinated care. Such systems represent strong examples of intervention characteristics particularly compatibility and design quality that facilitate adoption.

Policy incentives and national mandates have been powerful drivers of adoption. In the United States, the HITECH Act accelerated uptake in primary care by offsetting initial costs and signalling a national priority, though its benefits for community pharmacies have been limited and uneven [27]. Similar government-led efforts in Australia and the UK have helped embed EHR use across primary and community care. Funding models, policy direction, and interoperability strongly influence pharmacy-level adoption and sustainability. However, the question of who pays remains largely unresolved. In publicly funded systems (UK, Australia), EHR investment for pharmacists competes with other health priorities, while in mixed models (United States), costs may fall to pharmacies posing challenges for smaller, independent operators. Without stable, long-term funding arrangements, even well-designed programs risk patchy uptake and inconsistent integration. Expanding financial incentive programs, such as those under HITECH, to explicitly include community pharmacists could significantly accelerate adoption and integration. Comparable mechanisms could be adapted in Asia-Pacific health systems, for example, by providing time-limited incentive payments tied to demonstrable EHR use in community pharmacies, or subsidising integration for smaller independent operators to avoid widening digital inequities.

At the organisational and individual levels, building pharmacists' digital capability is essential. Structured training programs that enhance health IT literacy, clinical decision-support skills, and confidence with EHR systems increase readiness for adoption. Corporate or group pharmacy settings, with centralised IT infrastructure and leadership engagement, may be better placed to implement such systems, while independent pharmacies may require targeted support to achieve similar outcomes.

The clinical value of EHR access is clear. In one study involving an independent pharmacy located in the rural area in the Midwest region of the United States, pharmacists reviewed 263 patient profiles, of which 164 (62.4%) were deemed suitable for EHR-based clinical assessment [3]. This access to the EHR resulted in many clinical interventions, particularly in managing chronic diseases such as cardiovascular and endocrine disorders, including identifying inappropriate medication regimens, adjusting dosages based on renal function, detecting therapeutic duplications, and recommending changes to improve safety and effectiveness [3]. This expanded view significantly improved medication therapy management and patient adherence.

Access to community pharmacy dispensing records can be critical during care transitions. When hospitals can view this data, pharmacists' entries become actionable, helping to identify and correct medication errors at admission and discharge [28]. A systematic review and meta-analysis found that pharmacists conducting medication reconciliation in the community identify at least one discrepancy in 19-23% of patients reviewed after discharge [18]. Common issues included omitted medications or unexplained changes. In a separate independent community pharmacy study, pharmacists performed medication reconciliation for 60 discharged patients and detected an average of 3.85 discrepancies per patient, encompassing dosage errors, duplications, and omissions [19]. These consistent findings highlight how pharmacist-led reconciliation supports continuity of care and significantly improves patient safety in the hospital-to-home transition.

With better interoperability, supportive regulation, and targeted training, pharmacists are moving beyond dispensing to active clinical decision-making [12]. Pharmacists can interpret lab results, such as renal function, to recommend tailored medication dosing and identify potential contraindications. In doing so, pharmacists are repositioned from dispensers to active clinical collaborators supporting chronic disease management, immunisation efforts, and overall patient safety.

CONCLUSION

Community pharmacists' integration into EHR systems is essential for safer, more coordinated, and patient-centred care. To strengthen adoption, targeted policy and practice changes are needed. Expanding financial incentive programs modelled on initiatives such as the US HITECH Act would help both independent and corporate pharmacies invest in the necessary infrastructure. Establishing and enforcing national interoperability standards would ensure pharmacy systems can seamlessly exchange clinical data with hospitals, general practices, and other care providers. Equally important is embedding structured digital health training and clinical decision-support modules into pre-registration curricula and ongoing professional development, building pharmacists' confidence and capability in using EHRs. Implemented together, these measures would position pharmacists as active clinical collaborators, elevate the quality use of medicines, and improve therapeutic outcomes across health systems.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

ETHICS

Ethics approval was not required for this commentary.

AUTHOR CONTRIBUTIONS

AH: Data curation; Investigation; Project administration; Resources; Validation; Writing original draft; Writing – review & editing.

JS: Conceptualisation; Investigation; Project administration; Supervision; Resources; Validation; Writing – review & editing.

JSP: Conceptualisation; Investigation; Project administration; Supervision; Resources; Validation; Writing – review & editing.

IS: Conceptualisation; Investigation; Project administration; Supervision; Resources; Validation; Writing – review & editing.

JGT: Writing – review & editing; Visualisation.

KW: Conceptualisation; Data curation; Investigation; Project administration; Supervision; Resources; Validation; Writing – review & editing.

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APPENDIX

TABLE 1 COMPARATIVE SUMMARY OF COMMUNITY PHARMACIST ACCESS TO ELECTRONIC HEALTH RECORDS IN AUSTRALIA, THE UNITED KINGDOM, AND THE UNITED STATES.

Country	System	Access Level	Scope of Access
Australia	My Health Record (MyHR)	Two-way (Read & Write)	Pathology, imaging, immunisations, discharge summaries, specialist letters
UK	Summary Care Record (SCR)	Read-only	Prescriptions, allergies, limited GP information
USA	Health Information Exchange (HIE), PDMPs	Fragmented, region-specific	Dependent on local systems; often prescriptions and immunisations only

REFRAMING THE ROLE OF DENTAL AND ORAL HEALTH THERAPISTS: A CALL FOR RECOGNITION AS ADVANCED PRACTITIONERS IN NEW ZEALAND'S HEALTH SYSTEM

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ABSTRACT

Dental and Oral Health Therapists (DOHTs) have been integral for improving oral health equity in New Zealand for communities of all ages. Although DOHTs have a three-year health sciences degree and clinical control to diagnose, prescribe and interpret radiographs, undertake treatments including minor surgery, provide oversight and guidance for non-registered staff to do minor procedures, their current Public Service Association Allied Health, Scientific and Technical Multiemployer Collective Agreement scale (PSA MECA) which dictates the salary and conditions in the public sector does not reflect their skills or public health contributions, contributing to systemic workforce shortages. Using results from the Dental Council of New Zealand (DCNZ) workforce data and analysis of trends affecting the oral health field, this paper presents why it is essential to reform policies to address the inequalities DOHTs face in the public sector, keep them satisfied in their jobs, and recognise the level of complexity displayed by the profession. This perspective paper proposes DOHTs have same status as Nurse Practitioners or Clinical Psychologists and suggests that they should be given a separate pay structure from other Allied Health practitioners, thereby reflecting the nature of their autonomous role and the clinical responsibilities they independently undertake post-graduation, compared to other health sciences degrees.

KEYWORDS

workforce equity, institutional reform, advanced practitioner, salary scale, sustainable development, new zealand, oral health workforce

INTRODUCTION

Dental and Oral Health Therapists (DOHTs) play a critical role in promoting the health of people of all ages through direct dental care services at primary care settings. However, DOHTs are underrepresented and underappreciated professionally and financially when compared to other highly skilled healthcare workers. We propose that DOHTs are officially acknowledged and rewarded as advanced health professionals with independent responsibilities in the Aotearoa-New Zealand setting.

The inception of DOHTs stem from the establishment of the Dental Nurse (DN) in New Zealand in 1921 [1]. DNs received 2 years of training in a government department health course and were tasked with the primary objective of treating the rampant level of dental disease in New Zealand's children [1]. Since then, we have seen the evolution of the DN role which has developed into the DOHT profession that we see today; broadened in their professional responsibilities, service profile, training and education to better meet the oral healthcare needs of New Zealanders over their life course. This paper aims to reframe the role of DOHTs and argue for their recognition as advanced practitioners within the New Zealand health system.

THE ROLE AND TRAINING OF DOHTS

DOHTs in New Zealand undergo a rigorous three-year Bachelor of Oral Health program that combines classroom learning with practical experience in the field. The curriculum equips students to practice independently in a variety of settings that serve vulnerable populations over their life course. DOHT academics value early diagnosis, caries prevention, and adaptable care for Māori and Pasifika communities [2]. DOHTs are trained to provide both dental therapy, dental hygiene care, and promote oral health. Their role includes, but is not limited to, various core competencies outlined by the Dental Council of New Zealand (DCNZ) summarised in Table 1. They can fulfill roles in public health and at the same time offer hands-on clinical care (Table 2). The tasks they perform, such as assessing, diagnosing, developing treatment plans, and carrying them out, are comparable in both responsibility and the level of clinical decision making to other registered health practitioners, however the broadness of scopes is more similar to a medical physician without prescribing rights (3).

TABLE 1. SUMMARY OF CORE COMPETENCIES OUTLINED BY THE DCNZ FOR DOHTS [4] [5]

Core competencies	Dental therapists	Oral health therapists
Professionalism	✓	✓
Communication	✓	✓
Cultural competence & safety	✓	✓
Critical thinking	✓	✓
Scientific & clinical knowledge	✓	✓
Patient care (comprised of the following below)		
<i>Clinical information gathering</i>	✓	✓
<i>Diagnosis and risk determination</i>	✓	✓
<i>Oral health care planning</i>	✓	✓
<i>Establishing and maintaining oral health (including preventive care, periodontal management, dental management, extractions, pain management, dental emergencies, application, administering and suppling of prescription medicines, monitoring and assisting in orthodontics)</i>	✓* *gingivitis management only	✓
<i>Safe practice</i>	✓	✓
<i>Teamwork</i>	✓	✓
<i>The practice environment</i>	✓	✓

TABLE 2. COMPARISON OF COMPETENCIES ACROSS SELECTED NEW ZEALAND 3-YEAR HEALTH DEGREE PROFESSIONS.

Profession	Diagnose independently	Dispense meds independently	Perform clinical interventions	Take radiographs independently	Interpret radiographs	Carry out surgical procedures without supervision/direction	Take impressions and create prosthetic devices	Practice in settings as independent and lead clinician	Provide leadership in reprocessing and sterilisation at an advanced level
Dental and Oral Health Therapy	✓	X	✓	✓	✓	✓	✓	✓	✓
Nursing	✓	✓	✓	X	X	X	X	X	X
Occupational Therapy	✓	X	✓	X	X	X	X	✓	X
Social Work	X	X	X	X	X	X	X	✓	X
Radiographers	X	X	X	✓	✓	X	X	✓	X

However, DOHTs are treated the same as other allied health professionals on the generic Public Service Association Allied Health, Scientific and Technical Multiemployer Collective Agreement scale (PSA MECA), even though their training differs significantly from that of roles requiring less specialised or intensive clinical scope [6]. Other professions with similar levels of education, like midwives and physiotherapists, are designated separate salary scales and career ladders. The disproportion between how DOHTs are educated, the duties assigned, and the compensation they receive, combined with the fact that they're needed most by underserved communities, has resulted in the inability to maintain a sustainable oral health workforce [7], resulting in increased inequity in rural and other communities. Identifying that DOHTs have more extensive training than many other health professionals is key to building a stronger, more diverse, and fairer oral health workforce.

A COMPARATIVE LENS: NURSES VS. DOHTS

Nurse Practitioners (NPs) are highly valued as clinical leaders in the New Zealand healthcare sector. They undergo additional training and experience supervised care to obtain the ability to perform both prescribing and diagnostic duties (8). They are given their own salary scale and professional recognition in acknowledgement of the independence they bring to their jobs. DOHTs are registered health practitioners who are well-prepared to diagnose, treat, and oversee the care of children, adolescents and patients of all ages with various oral health problems and frequently with underlying health conditions. DOHTs play a crucial role in delivering oral health services in schools, general dental practices and rural communities, operating autonomously most of the time.

Independently developing and implementing a plan of care that may include surgical interventions is distinctive within Allied Health professions. DOHTs focus also includes developing a preventative plan for individual patients that may include oral health promotion and oral education for individuals, families, groups, classes or communities. Their evidence-based knowledge is unique to their professional group, with frequent comments from other health professionals advising they know very little about oral health care and oral health systems. DOHTs have also shown their value in the field of teledentistry by reducing access barriers for rural communities through innovative models of care delivery(9). They perform advanced therapies including extractions, restorations, and radiograph interpretation, injections and administration of dental-specific medications, comparable to those performed by other advanced practitioners such as NPs.

In contrast, DOHTs are grouped as general allied health professionals under the PSA MECA, failing to acknowledge their authority, autonomy and expectations placed on them in the workplace. There is a significant discrepancy in how they are remunerated, how their careers progress, versus the positive effects they have in healthcare generally. The mismatch in stature and remuneration has already and will continue to hinder the availability of the necessary workforce committed to reducing disparities in oral health outcomes throughout the country. DOHTs have the training, scope of practice, and

autonomy to be considered advanced practitioners. Aligning their duties and responsibilities with those of NPs is crucial to creating a just, viable, and dynamic oral health workforce.

PROFESSIONAL MARGINALISATION: THE WAGE GAP AND ITS IMPLICATIONS

DOHTs are a critical part of the New Zealand allied health workforce, yet they appear a low-valued group. The 2023–2025 PSA MECA sets the rate for DOHTs with Bachelor's degrees as starting at \$77,000 per annum. By comparison, psychologists on a separate salary scale begin their careers earning \$85,000 [10]. The starting base salaries of NPs on the NZNO agreement currently sit at over \$114,000 [11]. The DOHT pay disparity also clashes with that of, for example, dental assistants who can earn between \$72,000 and \$86,000 without requiring formal training or professional registration responsibility. Attracting and maintaining DOHTs is challenging in areas of the country with the highest oral health needs. Burnout rates are caused in part by ongoing staffing challenges and larger patient loads. Lack of rewards discourages new professionals and drives experienced clinicians away or to private practice where pay rates greatly exceed those in public service.

Pay inequity within Public Health pay structures is reflected in anecdotal comments from both recently graduated and experienced DOHTs who advise they are attracted to and plan to retain higher paid positions in private practice. DOHT's are also investing in private practice ownership reflecting a clear movement away from public service being the predominant employer.

Furthermore, statistics from the DCNZ Workforce analysis 2020–2022 depicts several alarming trends in the DOHT workforce. Progressively, the number of dental therapists (DTs) has declined from 458 in the year 2017/18 to 337 in 2021/22 whereas the number of oral health therapists (OHTs) have grown from 505 in the year 2017/18 to 753 in 2021/22 [11]. The main concern however is the reported median age and employment types between DTs and OHTs. In 2022, DT workforce in New Zealand had a median age of 56.8 years and 83.6% of those working as employees were in district health boards (public service) [11]. Conversely, the OHT workforce in 2022 were reported to have a median age of 31.5 years and only 35.6% of those working as employees were in district health boards (public service) [11]. A larger proportion of OHTs were also reported to be self-employed (10.3%) compared to only 4.6% of DTs [11]. These trends can be attributed to the significant pay discrepancies between public and private practice settings and the phasing out of DT training programs in preference for OHT courses.

As a result, essential aims of the New Zealand health system, such as reducing disparities, promoting child oral health, and developing a resilient, risk-focused approach to oral care, are jeopardised. The oral health sector may not achieve stability if resources are not allocated specifically for the development and reimbursement of DOHTs. Classifying DOHTs as advanced practitioners and linking their remuneration to their expertise are both essential for achieving sustainability and meeting the long-term needs of oral health services.

Recognising that this group also requires ring fenced time and financial recompense for ongoing professional development is also essential for ensuring that children's oral health care follows the evidence-base and that isolated clinicians have the time to continue evidence-based learning, adapt their practice and meet the needs of maintaining an annual practicing certificate

A CALL FOR POLICY REFORM

DOHTs play a key role in helping Aotearoa-New Zealand combat inequality in oral health and building a long-term, sustainable health system. DOHTs are currently underserved and undervalued by their classification under the umbrella of generic allied health workers within the PSA MECA. It runs counter to global health initiatives that stress the need for strengthening the oral health workforce to reduce existing inequalities [6]. DOHTs should be provided with separate salary levels equivalent to those given to NPs and psychologists. This change would recognise the many ways in which DOHTs

are clinically involved, skilled professionals who mostly operate independently. This provides an added advantage in attracting a diverse pool of talented DOHTs and increases the long-term stability of the workforce in hard-to-reach areas. It would strengthen recruitment, retention and job satisfaction of the workforce.

The WHO Oral Health Strategy (2023–2030) advocates for the development of oral health workforce strategies focused on designing skilled teams whose duties include providing children from disadvantaged communities with preventive oral health care. DOHTs are meeting the requirements of the mandate, and it has been proven over more than 100 years that they make a significant impact in the care delivered to Māori and Pasifika communities, but they still face neglect at the institutional level. With the implementation of Pae Ora, presently underway, we should integrate oral health equity into the very foundations of our healthcare systems. The Health New Zealand acknowledged the issue of a declining workforce in the Health Workforce Plan 2023/2024. With a projected shortage of 220 DOHTs. The NZDA Roadmap Towards Better Oral Health for New Zealand 2025-2030 acknowledges that while the scopes of DOHTs are broadening, with the ongoing issues of workforce numbers, the impact is uncertain. A distinct salary scale specifically for DOHTs represents a practical step toward achieving oral health goals set out by both New Zealand and international health agendas, and the ring-fenced availability of funding and time, similar in approach to that in the Senior Medical Officer Collective Agreement will help the profession to continue to build and maintain their skills and develop the evidence base

CONCLUSION

DOHTs are crucial practitioners in advancing oral health for the whole population in New Zealand. The qualifications and contributions of DOHTs merit identifying them as advanced healthcare professionals. Creating a clear professional pay band and professional development support will increase the attractiveness of DOHT as a desirable career and help integrate dental services with health and environmental targets.

Without implementing this system level reform, workforce shortages will be exacerbated during 2025-2030 with an increase in underserved populations, often rural and isolated, and the length of time between recalls, which are ideally set at 12 months. The flow on effect will be an increase in the number of children who are requiring oral health care under general anaesthetic due to their severity of decay. The experience of decay in childhood has a direct correlation to decay experience in adulthood, thereby condemning the next generation of adults to a lifetime of expensive dental care and/or pain and lost teeth, affecting their health and wellness beyond their childhood years.

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ASSESSMENT OF MANAGEMENT COMPETENCY AMONG SENIOR HOSPITAL MANAGERS IN NEPALESE PUBLIC HOSPITALS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Health managers often assume leadership roles with limited formal training. Health managers face ongoing constraints in accessing continuous professional development opportunities related to management competency throughout their careers. The management competency of health service managers is crucial since they perform wide-ranging complex tasks including financial oversight, workforce management, and governance for patient safety. It is thus essential to identify and assess health managers' current competency levels to understand the development needs and plans for both organisational and system level capacity building strategies.

A review of literature revealed a lack of studies specifically focused on assessing the competency of senior hospital managers in central level public hospitals in Nepal. While two studies were identified that examined managerial competency, the scope was limited to general hospital managers across all types of hospitals, without distinguishing senior leadership roles or central level hospitals. The two studies provided useful information but are limited because they were conducted prior to the federal democratic republic system in Nepal. With subsequent changes in the Nepalese health system, it is important to understand what the current level of management competency is for senior hospital managers in Nepal.

Therefore, a quantitative cross-sectional study was conducted utilising the Management Competency Assessment Partnership (MCAP) self-assessment tool to measure the current competency level and identify the competency gaps. The data were analysed with RStudio (R 4.3.3) and SPSS (version 29 for Windows). The study highlights competency gaps among senior hospital managers in areas such as resource management, evidence-based decision making, knowledge on healthcare environment, political acumen, and transition management which further underscores the need for prioritised targeted professional development interventions in these domains. A sustained investment in competency building and development will enable senior hospital managers to negotiate the challenges of contemporary hospital systems with greater confidence and competency. Such development approaches ultimately contribute to the long-term success and sustainability of Nepalese hospital management and healthcare settings.

KEYWORDS

management competency, competency assessment, senior hospital managers, Nepal

BACKGROUND

When clinicians such as doctors, nurses and allied health professionals, move into management roles, it is important for them to apply foundational leadership and management competencies to effectively perform the tasks and fulfil the responsibilities of leading hospitals and deliver quality health services [1]. Health managers often assume leadership roles with limited formal training, and many face ongoing constraints in accessing continuous professional development opportunities related to management competency throughout their careers [2]. Management competency is defined as “the skills, knowledge, personal characteristics and behaviours needed to effectively perform a role in the organisation and help the business meet its strategic objectives” [3, p. 5]. The management competency of senior and mid-level health service managers is crucial since they perform wide-ranging complex tasks including financial oversight, workforce management, and governance for patient safety [4]. Mid-level managers typically occupy middle tiers in the organisational hierarchy senior managers with clinical or professional responsibilities, supervision of front-line staff, and reporting to senior managers. In some health systems, e.g. Australia, senior-level managers hold top-tier leadership positions within hospitals which include roles such as medical director, hospital directors, and chief operating officers. They oversee strategic planning, financial governance, workforce management and patient safety systems, often shape organisational culture, and liaise with external stakeholders and policymakers [5,6]. Competent senior health service managers need the capacity to satisfactorily integrate clinical services, management, and political domains using leadership, collaboration and team-based competencies which are crucial for better health outcomes and quality healthcare [7,8,9].

The World Health Organization recommends all countries build leadership and management capacity ensuring adequate numbers of competent managers who provide critical management support systems and an enabling working environment [10]. A study in Kenya demonstrated increased coverage of child and maternal health services after piloting a six-month leadership program for management teams [11]. A significant increase in the number of client visits was observed at the facility level in the intervention group versus comparison facilities. The leadership program contributed to improved health service delivery outcomes and the improvements were sustained for at least for six months. The performance of health managers thus can be improved by improving their managerial competency [7]. However, it is essential to identify and assess health managers' current competency levels to understand the development needs and plans for both organisational and system level capacity building strategies.

MANAGEMENT COMPETENCY ASSESSMENT

Management competency assessment is an important step in performance management [12]. Competency assessment can identify gaps in knowledge and skills which, in turn, may be used to design development programs that address these gaps and consequently maintain organisational competitiveness and resilience [13]. This also ensures employee competencies are in sync with the evolving needs and objectives of the organisation [14,15]. Research evidence suggests that a person's self-judgement of their own knowledge, skills and abilities positively relates to their ability to improve current and learn new competencies. [16]. Research studies also reveal that such judgements provide managers with an opportunity to evaluate their strengths and weaknesses, and plan training based on their identified needs [17]. Therefore, effective tools for assessing management competency of health managers have implications for health service management workforce development.

Management competency assessment tools are important in identifying healthcare management strengths and weaknesses, enhancing managerial development, leadership, decision-making, succession planning and talent management, and ultimately ensuring compliance and quality [18,19]. In the healthcare context, three major types of management competency assessment are used: 360-degree feedback, competency-based interviews, and self-assessment [20,21,22,23]. 360-degree feedback provide a holistic assessment of a manager's competency based on feedback from subordinates, peers, and supervisors. This offers a comprehensive view of a healthcare manager's strengths and development areas and helps to identify blind spots and further enhancing leadership effectiveness [20, 21]. The feedback coming from multiple perspective, offers a broader, unbiased evaluation of managerial strengths and

weaknesses. However, a key disadvantage of 360-degree feedback is its complexity, it needs well-designed processes and implementation, while poor execution may lead to confusion and resistance among staff [21].

Competency-based interviews involve structured interviews that assess managerial competency through behavioural questions, allowing organisations to evaluate leadership skills based on real-world decision-making [22]. Competency based interviews evaluate past behaviours to predict future job performance and are often used in the hiring processes but not as much in assessing on-going management competency [23].

Self-assessment competency tools offer advantages such as personal reflection which fosters self-awareness, insights into areas for development, and require health managers to evaluate their competency across different management domains [19]. Unlike 360-degree feedback, which includes external opinions, self-assessments produce unfiltered introspection without external biases. Although self-assessment can be limited by individual biases and might lack the comprehensive perspective offered by 360-degree feedback, other factors such as convenience, accessibility, cost-effectiveness, immediate insights, and privacy can make self-assessment more suitable than other competency assessment tools. Self-assessment is a culturally adaptable and reliable which makes it especially valuable in contexts where other forms of competency evaluation may be impractical or counterproductive [24].

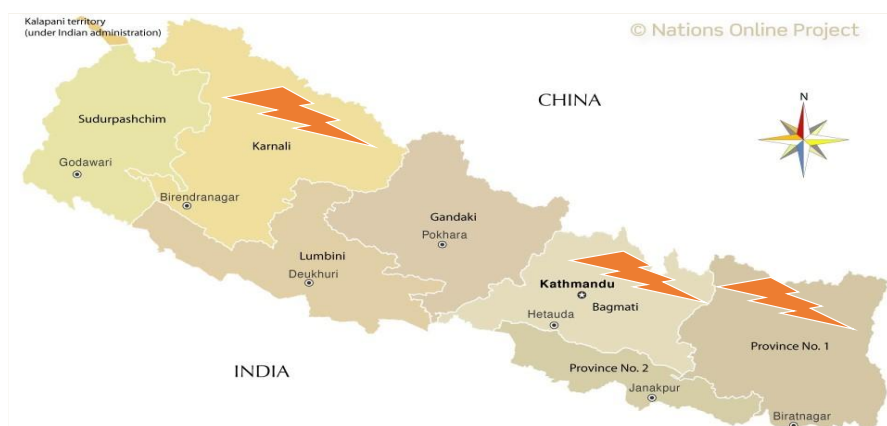
Given the context of this research, as outlined below, it was decided that a self-assessment competency tool was most appropriate. The Management Competency Assessment Partnership (MCAP) self-assessment tool was chosen because it identified globally recognised core competencies for health managers through a systematic review and best-fit framework synthesis of studies over a two-decade period up to 2019 [25]. Although the MCAP was originally developed and validated in Australia [26,27], it has been applied internationally in China [28, 29], India [30], Iran [31] and Finland [32] healthcare contexts, demonstrating its cross-cultural relevance and adaptability.

CONTEXT

Nepal moved from a central, unitary system of government to the Federal Democratic Republic system consisting of seven, self-governing provinces in September 2015 [33]. Although the federal system paved a new pathway for opportunities in building a better health system, the health system itself has many challenges including inefficient hospital management systems, hospital service provision, and coordination across government tiers [34].

Hospitals that are equipped with sophisticated facilities and provide speciality services are managed at the federal government level and are designated as central level hospitals [35]. There are 15 central level hospitals in three provinces, with 13 in Province No. 3 (Bagmati), and one each in Province No. 1 (Koshi) and Province No. 6 (Karnali). Central level hospitals provide complex care and the highest level of treatment services to public patients [36]. These hospitals are broadly accessible to the public because they have minimum fees, whereas private hospitals are costly and are for those who are from social and economically advantaged background.

FIGURE 1 MAP OF NEPAL SHOWING THE PROVINCES WITH CENTRAL LEVEL HOSPITALS.



Source: Nations Online Project. (n.d.). *Map of Provinces of Nepal*. Retrieved January 2023, from <https://www.nationsonline.org/oneworld/map/nepal-administrative-map.htm>

Senior hospital managers (SHMs) positions in central level hospitals are generally occupied by senior doctors with extensive clinical experience but without formal management education [8,37]. These positions encompass both clinical and non-clinical SHMs, reflecting the multidimensional leadership structure within hospitals. These professionals hold critical responsibilities, such as overseeing clinical service delivery, managing hospital resources, and coordinating operational activities to ensure consistent and effective health service provision. A review of literature revealed a lack of studies specifically focused on assessing the competency of SHMs in central level public hospitals in Nepal. While two studies were identified that examined managerial competency, the scope was limited to general hospital managers across all types of hospitals, without distinguishing senior leadership roles or central level hospitals [8,37]. These two studies, in 2012 and 2014, identified the need for in-service management training for SHMs and a lack of development strategies for managerial competency; one of the factors that limits effective and efficient hospital service provision [8,37]. The two studies provided useful information but are limited because they were conducted prior to the federal democratic republic system. With subsequent changes in the Nepalese health system, it is important to understand what the current level of management competency is for SHMs in Nepal.

Therefore, the aim of this study was to identify the current management competency level of SHMs in central level public hospitals in Nepal.

METHODS

This study utilised quantitative cross sectional survey design as the first part of a larger mixed methods research project. Data was collected from October to December 2023 using a paper-based questionnaire.

TARGET POPULATION

The target population was SHMs in the 15 central level public hospitals in Nepal. SHMs are hospital directors and chiefs of various departments employed at level eight through to eleven. These levels are distinct tiers within the government organisational hierarchy that classify employees' relative rank, responsibilities and authority. Examples of SHMs include chief medical officer, chief finance officer, chief of administration services, head of gynaecology, chief hospital pharmacist, head of dentistry, head of radiology, head of paediatrics, and the head of nursing.

The decision to include only public hospitals in this study was guided by the policy framework set out by the Ministry of Health and Population (MoHP) of Nepal, which holds primary responsibility for developing strategies, guidelines, and standards for public hospitals and health services [38]. Since MoHP does not extend regulatory authority or strategic development to private healthcare institutions, focusing on public hospitals ensures alignment with national health policy directives and allows the research to generate findings that are directly relevant to government-led health system improvements.

On review of the 13 central level hospitals in Bagmati Province, three were excluded because one was run by the army, one was run by the police, and one was an Ayurveda hospital providing a holistic medical system utilising herbal medicine, diet, nutrition, detoxification, yoga and meditation. As ayurveda emphasises balance between body, mind and spirit to heal imbalances of three doshas that represent biological energies governing physical and mental functions-Vata (air and space), Pitta (fire and water) and Kapha (earth and water) [39] and thus are different to other hospitals run by the Ministry of Health and Population. Contact information could only be obtained for six of the remaining ten central level public hospitals in Bagmati Province. Thus, a total of eight central level hospitals were invited to participate in the survey. However, the central level hospital in Koshi province and three central level hospitals in Bagmati Province did not respond to the request for participation in the study. The four remaining central level public hospitals that provided letters of acceptance to participate were:

1. Paropakar Maternity & Women's Hospital (PMWH) Kathmandu, Bagmati Province (Province No. 3)
2. Kanti Children Hospital (KCH), Kathmandu, Bagmati Province (Province No. 3)
3. Sukraraj Tropical and Infectious Disease Hospital (STIDH), Kathmandu, Bagmati Province (Province No. 3)
4. Karnali Academy of Health Sciences (KAHS), Jumla, Karnali Province (Province No. 6).

All the estimated 59 SHMs from the participating hospitals were invited to take part in the survey.

ETHICS APPROVAL

Ethics approvals were obtained from both Nepal Health Research Council (NHRC-545/2023) and James Cook University Australia Human Ethics Research Committee (H9203). Also, where applicable, hospital institutional ethics review committee (IERC) approval was obtained from the participating hospitals prior to data collection.

MEASUREMENT TOOL

The study utilised Management Competency Assessment Partnership (MCAP) self-assessment tool for measuring the competency level and identifying the competency gaps of SHMs [26,27]. The MCAP tool assesses six core management competencies including evidence informed decision making, operation administration and resource management, demonstrated knowledge of healthcare environment and the organisation, interpersonal communication qualities and relationship management, leading people and organisations, and enabling and managing change (Table 1) by measuring 82 behavioural items overall.

Prior to data collection, the MCAP was translated into Nepali by an official translator and pilot tested with five people in Nepal. The pilot testing participants were provided with the questionnaire via email and were requested to provide feedback on the clarity of the questions. Although the results of pilot testing demonstrated that the questionnaire was easy to understand and complete, there was a problem with translating the competency assessment descriptive scale.

In the English versions of the MCAP, the competency assessment descriptive scale is used to explain what the levels of competency mean and the related Likert scale score from one to seven. However, in Nepali an adequate distinction could not be made between the competency assessment descriptions for score 6 (*always apply in my role with extensive experience*) and 7 (*always apply appropriately in my role, with extensive experience gained from diverse management roles at executive level*). In discussion with the developer of the MCAP (ZL), it was decided to use a six-level competency assessment descriptive scale and six-point Likert scale (Table 2.A), knowing that this would make direct comparisons more difficult with other versions of the MCAP. The Nepali version used the existing five-point scale to assess the level of importance of competencies (Table 2.B). Lastly, the Nepali version did not include participant names, to help maintain confidentiality.

TABLE 1 MCAP CORE COMPETENCIES

Abbreviation	Core competency
C1	Evidence informed decision making
C2	Operation, administration, and resource management
C3	Demonstrated knowledge of healthcare environment and the organisation
C4	Interpersonal communication qualities and relationship management
C5	Leading people and organisations
C6	Enabling and managing change

TABLE 2 MCAP SCALES TO MEASURE LEVELS OF COMPETENCY AND IMPORTANCE

A. Competency assessment descriptive scale (level of competency)	
1	May be capable of demonstrating minor aspects in my role
2	May be capable of demonstrating in my role but not in all required aspects
3	Can fully demonstrate in my roles with regular guidance

- 4 Can generally demonstrate in my role but guidance is needed occasionally
- 5 Can demonstrate in my role independently without guidance
- 6 Always appropriately apply in my role with extensive experience

B. The level of importance to the management role

- 1 Very unimportant
 - 2 Not so important
 - 3 Unsure whether it is important
 - 4 Somewhat important
 - 5 Very Important
-

DATA COLLECTION

A paper-based participant information sheet, consent form, and questionnaire (including the Nepali version of the MCAP, demographic questions and three open-ended questions) was supplied to each appropriate Hospital Administrator for approval and distribution to the SHMs in their hospital. An internal letter from the Hospital Administrator was also distributed inviting their SHMs to participate in the survey. Participants were asked to return the questionnaire to a dedicated collection area within the administrative department. Hospitals were requested to send reminder emails to potential participants at the end of the first week and the end of the second week to return the questionnaire. Participants were ensured of confidentiality since the questionnaire was returned in an enclosed envelope and only the researcher had access to the dedicated collection box.

DATA ANALYSIS

Upon the receipt of the returned and completed questionnaires, the data were manually entered into Qualtrics, where a matching English version of the questionnaire was set up. The data were also directly entered to an Excel spreadsheet. Data was then downloaded from Qualtrics to check for accuracy against the Excel spreadsheet. This was effective in identifying and solving data entry errors. The data were analysed with RStudio (R 4.3.3) and SPSS (version 29 for Windows). Percentage of responses for level of importance and level of competency were calculated. Kruskal Wallis test and Fisher's test were conducted to test the association between variables and competency.

RESULTS

Of the 59 SHMs invited to participate, 50 completed the survey, resulting in a response rate of 85% and a maximum margin of error of 5.5%.

MANAGEMENT EXPERIENCE

The average experience of SHMs in their current management position was 4.8 years while the average years of experience in management roles overall, including their current position, was 8 years (Table 3). In their current position, 56% of SHMs (n = 28) had less than five years' experience, while 68% of SHMs (n = 34) had greater than five years' total experience in management roles (Table 4).

TABLE 3 WORK EXPERIENCE OF SHMS

No. years	Current position	Management overall
Mean	4.8	8.0
Median	3.5	7.0
Minimum	1.0	1.0
Maximum	36.0	36.0

TABLE 4 YEARS EXPERIENCE IN CURRENT POSITION AND OVERALL

Experience	Current (%)	Overall (%)
<5 years	28 (56)	16 (32)
5-10 years	18 (36)	21 (42)
10-20 years	3 (6)	10 (20)
>20 years	1 (2)	3 (6)

QUALIFICATIONS OF SHMS

The majority of SHMs (n= 41, 82%) possessed a postgraduate qualification with 80% (n = 40) having a master's degree and one person had a PhD (Table 5). The disciplines of these degrees are detailed in Table 5.

TABLE 5 QUALIFICATIONS OF SHMS

Qualification	N (%)	Description
Bachelor	9 (18)	Bachelor of Medicine and Bachelor of Surgery (MBBS), Bachelor of Hospital Nursing/Bachelor of Nursing (BN), Bachelor of Science Medical Laboratory Technology (BSCMLT)
Master	40 (80)	Doctor of Medicine (MD), Master of Nursing (MN), Master of Business Administration (MBA), Master of Orthopaedic Surgery (MS), Master of Dermatology (MD), Master of Business Studies (MBS), Master of Rural development (RD), Master of Mathematics, Master of Child Development, Master of Public Health (MPH), Master of Clinical Pathology
PhD	1 (2)	Global Health

In addition, 10% of SHMs (n = 5) were currently enrolled in a degree which included Master of Public Administration, Master of Business Administration, Master of Public Health, and PhD Global Health.

Participants were asked whether they had participated in any training (non-degree program) for more than 10 hours per year in the past three years (Table 6). Thirty-eight percent (n = 19) were engaged in management training or self-study on management-related topics. Sixty two percent of SHMs (n = 31) had not participated in any type of training.

TABLE 6 TRAINING PARTICIPATION FOR MORE THAN 10 HOURS PER YEAR IN THE PAST 3 YEARS

Training type	N (%)
Non-management	5 (10)
Management	10 (20)
Self-study, management-related	9 (18)
None of above	31 (62)

DIFFICULTIES ENCOUNTERED BY SHMS

SHMs were asked to indicate the three most common management difficulties they had encountered in the past three years in their management roles from a list of 14 provided in the MCAP tool (Table 7). The three most encountered difficulties were high staff turnover (21, 42%), changing team skill requirements (16, 32%), and losing a high potential employee (15, 30%). Other difficulties faced included: Confronting an employee performance problem, ranked 4, n = 13, 26%; Peer conflict; Making right hiring decisions, and Confronting higher management level, each ranked 5, n = 12, 24%.

TABLE 7 DIFFICULTIES ENCOUNTERED BY SHMS

Rank	Difficulty	N (%)
1	High staff turnover	21 (42)
2	Changing team skill requirements	16 (32)
3	Losing a high potential employee	15 (30)
4	Confronting an employee performance problem	13 (26)
5	Peer conflict	12 (24)
6	Making right hiring decisions	12 (24)
7	Confronting higher management level	12 (24)
8	Having to learn something new such as information or medical technology	9 (18)
9	Employee engagement in decision-making and implementation of change	8 (16)
10	Team conflict	7 (14)
11	Conflicts with patients	7 (14)
12	Creating an innovative team	6 (12)
13	Doing something unethical or wrong	5 (10)
14	Other	3 (6)

INSIGHTS FROM OPEN-ENDED RESPONSES

At the end of the questionnaire, participants were provided with open-ended questions to outline in their own words the difficulties they encountered in organisational management. Only five participants responded to the open-ended questions, which was focused on exploring the challenges faced by SHMs in their roles, the underlying causes and potential organisational-level solutions, as well as their aspirations for career development. Participants primarily shared insights on the challenges faced by SHMs. A recurring theme was the prevalence of political issues in the workplace, such as political pressure, high-level interference, and personnel promotions influenced by favouritism and political connections. These dynamics often undermined merit-based progression and created a demotivating work environment. SHMs also reported facing resistance from subordinates, particularly in relation to the implementation of organisational changes. This resistance hindered smooth transitions and innovation. A particularly concerning issue raised by one SHM was the exposure to violence and abuse from patients or their families. This not only compromised the safety and wellbeing of SHMs but also contributed to their reluctance to continue in their current positions. Among the challenges identified, resistance to change aligned with difficulties outlined in the MCAP tool, whereas the other four types of difficulties (political interference and political pressure, promotions based on favouritism, inadequate benefits and poor work facilities, and instances of violence or abuse from patients and their families) emerged as additional concerns not previously captured in the MCAP tool's predefined options.

MANAGEMENT PREPAREDNESS, COMPETENCY AND IMPORTANCE

MCAP INTERNAL CONSISTENCY

The number of respondents was larger than the sample size required for Cronbach's alpha of $n = 38$ (where, $\alpha = 0.05$, precision $w = 0.1$, previous reliability $r = 0.9$, and the lowest number of items in C6 $q = 9$) [40]. Cronbach's alpha for the respondents' level of competency and level of importance exceeded 0.90 for each core competency (Table 8). This showed that the MCAP scale had very good internal consistency for the Nepali version.

TABLE 8 MCAP INTERNAL CONSISTENCY (CRONBACH'S ALPHA)

Level of competency		Level of importance	
Competency*	alpha (95% CI)	Competency*	alpha (95% CI)
C1	0.95 (0.94, 0.96)	C1	0.92 (0.91, 0.94)
C2	0.96 (0.95, 0.96)	C2	0.90 (0.88, 0.92)
C3	0.96 (0.95, 0.96)	C3	0.92 (0.90, 0.94)
C4	0.97 (0.97, 0.98)	C4	0.94 (0.93, 0.95)
C5	0.96 (0.96, 0.97)	C5	0.91 (0.89, 0.93)
C6	0.96 (0.95, 0.97)	C6	0.90 (0.88, 0.92)

* See Table 1 for core competency abbreviations

MANAGEMENT COMPETENCY BEFORE TAKING UP THE CURRENT MANAGEMENT ROLE

Participants were asked to indicate the extent to which competencies were acquired before taking up their current management role (Table 9). Overall, 40-50% of SHMs indicated that they were competent in the six core competencies prior to taking up their current management position. Prior to taking the current management role, the highest number of SHMs, 50% (n = 25), self-assessed themselves as competent in C1 *Evidence informed decision making*. This was followed by C2 *Operation, administration, and resource management* and C5 *Leading people and organisations*, both at 48% (n = 24). 32-42% of SHMs (n = 16-21) self-assessed themselves as requiring occasional guidance before undertaking their current role for the six core competencies.

TABLE 9 COMPETENCY PRIOR TO CURRENT ROLE

Competency* [N (%)]	Not yet competent (1-3)	Occasional guidance (4)	Competent (5)	Expert (6)
C1	6 (12)	19 (38)	25 (50)	0
C2	5 (10)	21 (42)	24 (48)	0
C3	10 (20)	20 (40)	20 (40)	0
C4	9 (18)	18 (36)	23 (46)	0
C5	10 (20)	16 (32)	24 (48)	0
C6	8 (16)	21 (42)	21 (42)	0

* See Table 1 for core competency abbreviations

PERCEIVED IMPORTANCE OF MANAGEMENT COMPETENCIES

The majority of the SHMs (96-100%, n = 48-50) perceived the six core competencies as somewhat or very important to their current management role (Table 10). 4% (n = 2) indicated C3 *Demonstrated knowledge of healthcare environment and the organisation* was not so important or were unsure, and 2% each (n = 1) were unsure about the importance of C4 *Interpersonal communication qualities and relationship management* and C5 *Leading people and organisations*.

TABLE 10 SHMS PERCEIVED IMPORTANCE OF MANAGEMENT COMPETENCIES

Competency* [N (%)]	Very unimportant	Not so important	Unsure	Somewhat important	Very important
C1	–	–	–	10 (20)	40 (80)
C2	–	–	–	17 (34)	33 (66)
C3	–	1 (2)	1 (2)	18 (36)	30 (60)
C4	–	–	1 (2)	12 (24)	37 (74)
C5	–	–	1 (2)	7 (14)	42 (84)
C6	–	–	–	13 (26)	37 (74)

* See Table 1 for core competency abbreviations

SELF-ASSESSED COMPETENCY

Overall, 56-72% of SHMs ($n = 28-36$) indicated that they were currently competent or expert in the six core competencies (Table 11). The highest percentage of SHMs who self-assessed themselves as competent or expert was for C5 *Leading people and organisations* (72 %, $n = 36$) followed by C4 *Interpersonal communication qualities and relationship management* (70%, $n = 35$), and the least was C2 *Operation, administration, and resource management* (56%, $n = 28$) followed by C3 *Demonstrated knowledge of healthcare environment and the organisation* (62%, $n = 31$) and C1 *Evidence informed decision making* (64%, $n = 32$). Also, the occasional guidance necessary were highest for C2 *Operation, administration, and resource management* (30%, $n = 15$) followed by C1 *Evidence informed decision making* (24%, $n = 12$) and C3 *Demonstrated knowledge of healthcare environment and the organisation* (18%, $n = 9$).

TABLE 11 SHMS SELF-ASSESSED LEVEL OF COMPETENCY

Competency* [N (%)]	Not yet competent (1-3)	Occasional guidance (4)	Competent (5)	Expert (6)	Competent/ Expert (5-6)
C1	6 (12)	12 (24)	18 (36)	14 (28)	32 (64)
C2	7 (14)	15 (30)	18 (36)	10 (20)	28 (56)
C3	9 (18)	9 (18)	25 (50)	6 (12)	31 (62)
C4	4 (8)	11 (22)	18 (36)	17 (34)	35 (70)
C5	7 (14)	7 (14)	16 (32)	20 (40)	36 (72)
C6	8 (16)	9 (18)	17 (34)	16 (32)	33 (66)

* See Table 1 for core competency abbreviations

COMPETENCY FOR INDIVIDUAL BEHAVIOURAL ITEMS

The highest percentage of SHMs that self-assessed themselves as a competent or expert for individual behavioural items (Appendix A) of each competency were: C1.13 *Commit to ongoing personal and professional development* (70% , $n = 35$), C2.1 *Complete necessary workforce records e.g. overtime, leave, rosters, attendance, absence to inform the payroll process* (72%, $n = 36$), C3.11 *Effectively navigate organisational structures, roles and relationships in order to achieve work goals* (60%, $n = 30$), C4.3 *Listen and empathise with others* (80%, $n = 40$), C5.10 *Persevere to achieve goals* (78%, $n = 39$) and C6.3 *Act accountably and accept personal responsibility* (72%, $n = 36$).

Among the behavioural items the lowest percentages for competent or expert were (Appendix A): C1.4 *Critically appraise the validity and relevance of evidence* (52%, $n = 26$), C2.5 *Develop budgets in accordance with organisational objectives*, and C2.7 *Anticipate and plan for changes in policies affecting funding to the organisation/unit* (42%, $n = 21$), C3.2 *Demonstrate understanding of political, social, technical and economic factors and their impact on the organisation* (50%, $n = 25$), C4.12 *Consider and act with sensitivity to the politics of any given situation* (48%, $n = 24$), C5.9 *Establish and maintains a personal and professional support network* (56%, $n = 28$), and C6.7 *Implement change and effectively manage the transition process* (52%, $n = 26$).

INDIVIDUAL SCORES WITHIN EACH CORE COMPETENCY

A Kruskal-Wallis test was performed to examine associations between individual scores for level of competency (C1.1, C1.2,... etc) within each core competency (C1-C6). The results indicated a statistically significant difference between individual scores for level of competency within C2 *Operation, administration, and resource management* ($\chi^2(16) = 30.2$, $p = 0.0169$) and C4 *Interpersonal communication qualities and relationship management* ($\chi^2(18) = 34.1$, $p = 0.0124$). No statistically significant differences were observed among the remaining groups (C1 *Evidence informed decision making* $\chi^2(12) = 6.97$, $p = 0.8597$; C3 *Demonstrated knowledge of healthcare environment and the organisation* $\chi^2(10) = 1.97$, $p = 0.9966$; C5 *Leading people and organisations* $\chi^2(12) = 17.2$, $p = 0.1409$; C6 *Enabling and managing change* $\chi^2(8) = 5.03$, $p = 0.7540$).

TABLE 12 MCAP BEHAVIOURAL ITEMS (COMPETENCY AND IMPORTANCE)

Note: the MCAP tool and behavioural items are copyrighted. Use of the MCAP tool or the behavioural items require the written approval of Dr Zhanming Liang. Dr Liang can be contacted at zhanming.liang@jcu.edu.au

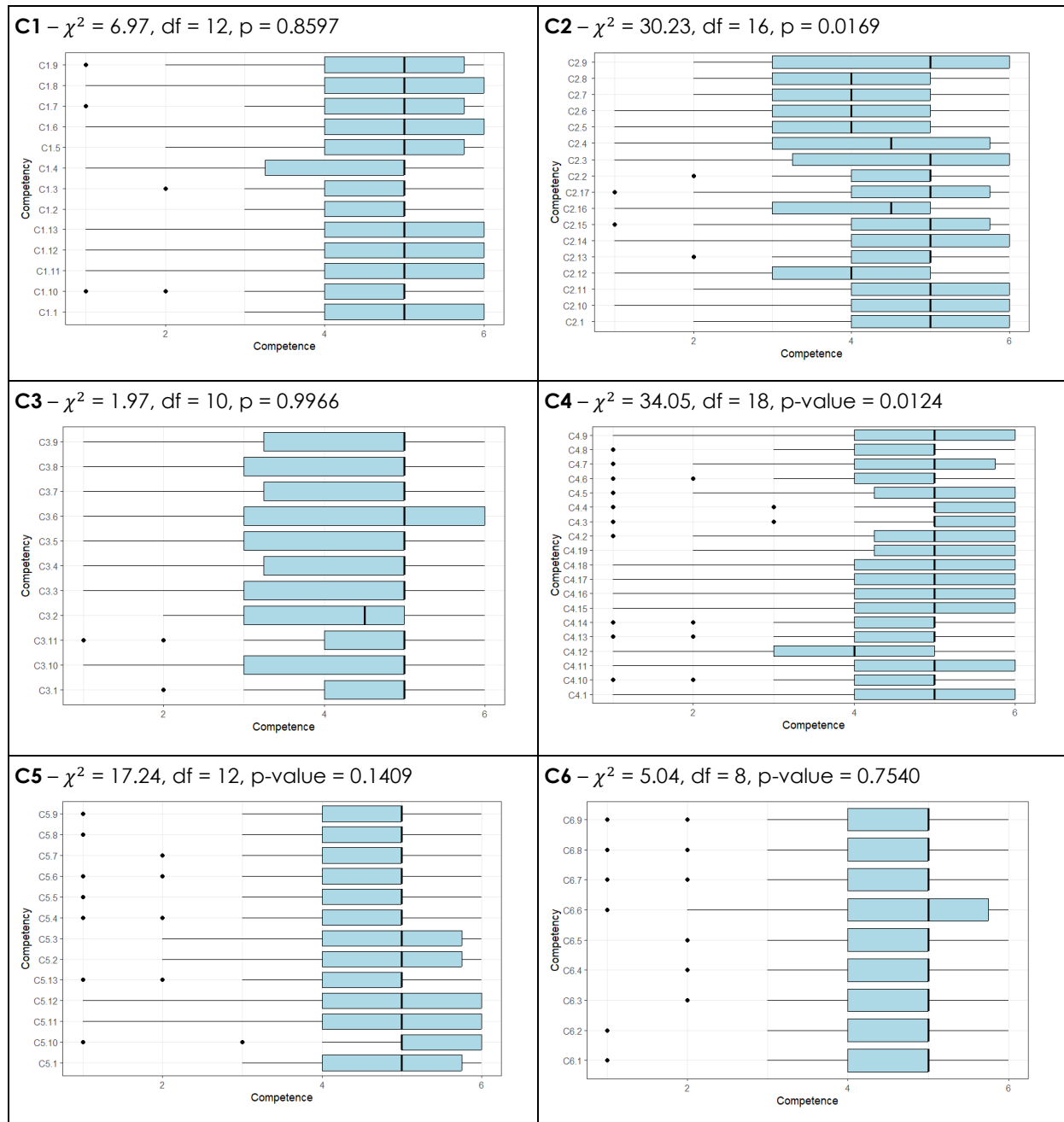
Behavioural item	Level of competency (%)						Level of importance (%)				
	1	2	3	4	5	6	1	2	3	4	5
C1. Evidence informed decision making											
1. Use timely and appropriate questioning/investigation to identify the nature of a problem, issue, or opportunity	0	0	14	18	34	34	0	0	0	20	80
2. Seek appropriate evidence from multiple organisational sources to guide the identification of solutions	0	0	14	26	36	24	0	0	4	22	74
3. Seek appropriate (qualitative/quantitative) evidence from multiple external sources to guide the identification of solutions	0	2	10	24	40	24	0	0	6	32	62
4. Critically appraise the validity and relevance of evidence	2	4	20	22	30	22	2	2	2	36	58
5. Assess and prioritise the relevance of evidence to the question(s)	0	2	14	24	34	26	0	0	4	36	60
6. Use evidence to question and improve existing practice and processes	2	2	14	20	28	34	0	0	4	28	68
7. Apply the best form(s) of evidence to guide management decision-making	2	0	12	26	34	26	0	0	6	28	66
8. Evaluate the process of seeking and applying evidence to management decision-making	0	0	14	30	24	30	0	0	6	38	65
9. Anticipate decision implementation problems/ impacts and develops and communicate appropriate contingency plans	2	2	14	22	34	26	0	2	2	34	62
10. Set and use measures to evaluate decision outcomes	2	2	18	20	34	24	0	2	4	38	65
11. Support and encourage colleagues and subordinates to use evidence to guide decision-making	2	0	14	24	28	32	0	0	2	32	66
12. Anticipate and prepare for the future by staying abreast of best practice and emerging trends that will have an impact on health outcomes	2	2	16	22	28	30	0	0	0	14	86
13. Commit to ongoing personal and professional development	2	0	8	20	36	34	0	0	4	26	70
C2. Operation administration and resource management											
1. Complete necessary workforce records (e.g. overtime, leave, rosters, attendance, absence) to inform the payroll process	0	4	8	16	40	32	0	0	6	34	60
2. Balance the needs of organisation and of staff through effective planning and management of staff roster and work coverage	0	2	8	26	40	24	0	0	4	42	54
3. Interpret basic financial statements	4	16	14	20	26	28	4	0	12	30	54
4. Monitor financial performance by analysing a variety of financial data	4	16	20	18	24	26	4	2	4	34	56
5. Develop budgets in accordance with organisational objectives	4	14	20	20	24	18	4	0	8	32	56
6. Manage budgets in accordance with organisational objectives	4	10	20	20	28	18	4	0	6	26	64

Behavioural item	Level of competency (%)						Level of importance (%)				
	1	2	3	4	5	6	1	2	3	4	5
7. Anticipate and plan for changes in policies affecting funding to the organisation/unit	0	16	26	16	24	18	0	4	8	36	52
8. Design and develop appropriate roles and reporting structure (across a range of areas) in accordance with organisational objectives	0	6	30	16	24	22	0	2	8	36	54
9. Effectively manage recruitment, selection, and appointment of sufficient, suitably skilled staff	0	6	22	14	24	34	0	0	8	32	60
10. Effectively manage staff turnover and retention	2	2	14	22	30	30	2	0	2	38	58
11. Manage staff in accordance with human resource policy and procedure	0	2	18	16	30	34	0	0	2	40	58
12. Establish and maintain the organisation's insurance contracts and financial relationships	2	12	16	24	26	20	0	4	12	28	56
13. Conduct regular two-way performance review & development discussions to support staff development	0	6	14	16	40	24	0	0	4	38	58
14. Recognise and develop the performance of others by providing timely and appropriate feedback	4	2	16	18	32	28	2	0	6	34	58
15. Contribute to continuous improvement of organisational processes, including quality and safety	4	2	16	26	26	26	2	0	2	32	64
16. Use performance measures and industry benchmarks to inform continuous performance improvement	2	6	20	22	36	14	2	2	4	36	56
17. Plan, execute and evaluate projects with significant scope and impact	2	8	12	24	28	26	2	0	6	34	58
C3. Demonstrated knowledge of healthcare environment and the organisation											
1. Demonstrate understanding of the healthcare industry and its impact on healthcare organisations	0	4	18	26	34	18	0	0	10	44	46
2. Demonstrate understanding of political, social, technical and economic factors and their impact on the organisation	0	10	26	14	30	20	0	4	12	40	44
3. Demonstrate understanding of the roles of key stakeholders in health and how they interact	2	4	22	14	34	24	0	0	14	36	50
4. Demonstrate understanding of the highly professionalised health workforce	4	6	16	16	46	12	0	0	10	40	50
5. Apply relevant legislation and accountability frameworks specific to healthcare settings	2	2	24	20	28	24	0	0	8	32	60
6. Demonstrate awareness of clinical and non-clinical risks specific to healthcare organisations	2	2	26	16	24	30	0	0	12	42	46
7. Apply quality indices and benchmarks to identify opportunities, set performance standards and improve quality	2	2	22	22	34	18	0	0	6	44	50
8. Apply risk management concepts and techniques in their work	2	6	22	18	32	20	0	4	8	26	62

Behavioural item	Level of competency (%)						Level of importance (%)				
	1	2	3	4	5	6	1	2	3	4	5
9. Demonstrate understanding of the diversity of healthcare needs	2	4	20	22	30	22	0	0	8	38	54
10. Demonstrate awareness of the organisational history, culture and development	2	2	24	18	32	22	0	0	6	46	48
11. Effectively navigate organisational structures, roles and relationships in order to achieve work goals	2	6	16	16	38	22	0	0	10	30	60
C4. Interpersonal, communication qualities and relationship management											
1. Show trust and respect for others in their actions	2	2	2	22	26	46	0	0	4	18	78
2. Provide appropriate support to others in the workplace	2	2	6	16	26	48	0	0	0	24	76
3. Listen and empathise with others	2	0	6	12	38	42	0	2	0	18	80
4. Engage confidently and constructively in verbal and non-verbal interactions with others	2	0	6	16	46	30	0	2	2	26	70
5. Communicate verbally in a clear, logical and grammatically correct manner in both formal and informal situations	2	2	6	16	38	36	0	0	2	36	62
6. Produce written reports/materials which are appropriate for both audience and purpose	2	2	8	26	40	22	0	0	6	36	56
7. Invest time and effort in working and engaging with stakeholders	2	2	4	28	38	26	0	0	8	32	60
8. Actively question, listen, respond and provide feedback as a basis for effective communication	2	0	8	30	36	24	0	0	4	42	54
9. Function effectively in a team by developing and maintaining professional relationships with people from a wide range of backgrounds	2	2	10	24	34	28	0	2	8	32	58
10. Build collaborative internal and external relationships	2	4	8	26	36	24	0	0	4	40	56
11. Adopt a flexible, client-oriented approach that is sensitive to diverse needs	2	6	8	22	34	28	0	0	6	40	54
12. Consider and act with sensitivity to the politics of any given situation	2	4	20	24	24	24	2	2	10	42	44
13. Work through conflict (and with diverse views) by initiating and engaging in robust conversations	2	2	18	26	32	20	0	4	10	42	44
14. Demonstrate awareness of own emotions and their impact on others	2	4	6	24	40	24	0	0	8	44	48
15. Show self-control over disruptive emotions and impulses	2	0	6	28	36	28	0	0	4	36	60
16. Maintain focus, set realistic goals and are not easily distracted	2	0	16	22	32	28	0	0	6	30	64
17. Show awareness of, and sensitivity to, the feelings of others	2	0	12	16	36	34	0	0	8	24	68
18. Invest time in self-care and personal support mechanisms, especially during stressful times.	2	0	12	18	38	30	0	0	4	32	64
19. Promote and adhere to high standards for personal and organisational integrity, honesty, transparency and respect for people	0	2	6	18	36	38	0	0	4	26	70

Behavioural item	Level of competency (%)						Level of importance (%)				
	1	2	3	4	5	6	1	2	3	4	5
C5. Leading people and organisations											
1. Develop and/or implement a shared vision to achieve organisational goals	0	0	16	22	36	26	0	0	6	32	62
2. Manage with reference to the broader organisational context	0	2	14	22	36	26	0	0	2	46	52
3. Engage effectively in organisational decision-making	0	2	10	24	38	26	0	0	4	36	60
4. Inform and educate influential decision makers	2	2	6	24	40	24	0	0	6	36	58
5. Balance the values and priorities of both organisation and profession(s)	2	0	12	24	40	22	0	0	4	38	58
6. Lead, develop and evaluate performance to build an effective team	2	2	12	26	48	10	0	0	2	40	58
7. Empower others to achieve goals	0	4	12	20	42	22	0	0	4	28	68
8. Adapt leadership style to suit the situation	0	2	14	22	44	18	0	0	6	30	64
9. Establish and maintain a personal and professional support network	2	0	18	24	32	24	0	0	10	36	54
10. Persevere to achieve goals	2	0	8	12	32	46	0	0	4	20	76
11. Demonstrate energy, commitment and enthusiasm	2	0	6	24	34	34	0	2	4	22	72
12. Encourage ideas and identify opportunities	2	0	8	20	42	28	0	0	2	26	72
13. Remain calm whilst under pressure	2	8	8	22	38	22	0	4	4	28	64
C6. Enabling and managing change											
1. Explain the need for change in an effective way	2	0	14	24	42	18	0	0	2	44	54
2. Assess readiness for change and plans accordingly	2	0	16	22	48	12	0	0	2	38	60
3. Act accountably and accept personal responsibility	0	2	10	16	50	22	0	0	2	30	68
4. Effectively balance consultation and decisiveness in decision making	0	2	20	10	48	20	0	0	2	38	60
5. Use available evidence to appraise options	0	4	18	14	42	22	0	0	6	36	58
6. Anticipate and appreciate the impact of change and plans accordingly	2	6	12	22	32	26	0	0	4	40	56
7. Implement change and effectively manage the transition process	2	2	20	24	34	18	0	0	4	44	52
8. Evaluate the processes and outcomes of change	2	4	14	26	38	16	0	0	4	44	52
9. Recognise and tolerate ambiguity	2	4	12	16	44	22	0	0	4	40	56

FIGURE 2 KRUSKAL WALLIS RANK SUM TEST BY CORE COMPETENCY



ASSOCIATION BETWEEN TRAINING AND COMPETENCIES

Kruskal-Wallis's rank sum test suggested a positive association between management training and self-assessed competency, but the association did not achieve statistical significance ($p=0.6376$).

ASSOCIATION BETWEEN EXPERIENCE AND COMPETENCIES

The Fisher's test indicated no significant difference in the proportion of SHMs with high competency (scoring a level of competency 5 or 6) and their level of experience categorised as low being (<3 years) or high (>3 years) of experience ($p = 0.27$).

DISCUSSION

This study showed that 96 to 100% of SHMs scored the six core management competencies from the MCAP tool as either important or very important, reinforcing the suitability of MCAP tool to the international context [28,29,30,31,32] including Nepalese senior hospital managers.

The self-assessment data presents a revealing picture of current levels of competency among Nepalese SHMs across the six core domains. Most SHMs reported competency expertise in leading people and organisations, closely followed by strengths in communication and relationship management. In comparison, findings from studies in China and Iran which used the MCAP tool highlighted that hospital executives rated themselves significantly lower in leadership competency [28,31]. In contrast the findings from this study suggest a strong foundation in leadership and interpersonal skills, both critical for influencing teams and driving organisational goals.

However, not all SHMs are fully proficient in the core competencies since levels of competency for SHMs across the domains ranged between 56 and 72% suggesting a need for targeted professional development strategies. In particular, areas such as resource management, knowledge of the healthcare environment, and evidence-informed decision making were the least developed competencies indicated by SHMs. This aligns with findings from India, where project managers considered themselves as least competent for evidence informed decision making and knowledge on healthcare organisation [30]. Furthermore, the lowest levels of competency were in SHMs developing budgets aligned with organisational goals which signals either a skill gap or a lack of adequate support structures in financial planning. Additionally, the open-ended questions identified SHMs lower level of confidence in political acumen and managing the change. These findings highlight a critical need for targeted competency-building in three core competencies along with additional support on strengthening working politics and change management for effective and efficient hospital management and service provision in central level public hospital in Nepal.

The primary focus needs to be on resource management including financial insights and budgets to bridge the competency gaps of SHMs. This is further supported by broader literature such as Ziv et al. (2003) who identified that the resource management training programs have good outcomes for fillings competency gaps in health managers specifically for the well organised use of resources [41]. Additionally, research evidence shows that simulation- and scenario-based learning is a cost-effective positive method for improving performance of health executives which supports the acquisition of critical management skills and confidence while incubating a culture of safety [42,43]. Likewise, cross-functional mentorship programs can be utilised for aiding SHMs to improve their management performance in areas like accounting, HR, monitoring, and evaluation [44], in addition to better team dynamics [45].

The second priority is to deepen SHMs understanding on health care environment. This requires increased comprehension of hospital systems and organisational structures including system-wide functions, policy and governance. Workshops and collaborative learning initiatives involving system experts may be included to facilitate the contextualised learning for SHMs, thereby enhancing their understanding of organisational structures within specific healthcare settings [46]. It has been acknowledged that such collaboration fosters deeper insights into governance, policy and operational frameworks, promotes cross-level dialogue and strengthens resilience and adaptability through shared problem-sharing [46]. Furthermore, as a potential strategy, the learning health systems (LHS) framework, which aligns people, data, and organisational culture to enable ongoing learning and innovation, may be employed to foster continuous, context-sensitive improvement [47]. The LHS framework uses real-time evidence from clinical practice to inform decisions, ensuring that new knowledge is rapidly translated into better care. By promoting shared understanding across all levels of the health system, the framework may be utilised to facilitate sustained transformation [47].

The third priority is SHMs knowledge of evidence-based decision making which includes development of skills to access, interpret, and apply research and data in policy and practice. The integration of case-based learning and analytics training may present a valuable approach for developing managerial competency and capabilities of SHMs. By embedding case-based learning within the professional development programs, SHMs can engage in contextualised, experiential learning that deepens their understanding of evidence-based decision-making frameworks [48,49]. This teaching method is effective in cultivating critical thinking, collaborative problem-solving, and systems-level reasoning that is important for negotiating complex areas such as governance, policy and operational challenges in healthcare settings [48,49].

The fourth priority this study identified was a lack of confidence among SHMs in overseeing politically delicate circumstances. This suggests an inadequate exposure to political acumen training along with insufficient assistance during professional development for SHMs and reflects the importance of targeted capacity building initiatives in political literacy and policy navigation. This sentiment is echoed on study by Waring et al. (2023), who emphasises the implementation of targeted capacity-building initiatives, such as leadership development programs incorporating political education, stakeholder engagement, and policy navigation [50]. Therefore, this study underscores the importance of embedding these components into both pre-service education and ongoing professional development program for SHMs to foster greater preparedness and competency in navigating complex political environments within Nepalese public hospital settings.

The final priority is the competency gap in implementing and managing change processes effectively which suggests a need for professional development strategies for SHMs focusing on change management approach. A study by Le-Dao (2025) identified that addressing shortfalls in change management may include introduction of targeted professional development initiatives on change leadership and transition management underlying stakeholder management, resilience, and strategic alliance for uplifting transition management competencies [51]. These finding collectively underscore the importance of planned and structured development approaches as a foundational support to boost SHMs performance attaining organisational persuasiveness, and system sustainability. Together with the development of SHMs resilience and adaptability, the structured and targeted approaches for competency development ensures that SHMs are well-equipped to navigate the complexities of modern public hospital management in Nepal with competence and conviction.

These findings, along with highlighting a critical need to support Nepalese SHMs in developing the core managerial competencies, are relevant across the broader Asia Pacific region, principally in developing countries where health system strengthening remains uneven. As highlighted in several analyses, discrepancy in management and leadership development have obstructed steady progress in healthcare delivery [25,37,52]. By incorporating the competency development needs identified in Nepal, other nations with similar socio-political and economic contexts, such as Bhutan, Papua New Guinea, and parts of Southeast Asia could benefit from a targeted approach to building managerial competency. This aids regional efforts in advancing healthcare management and enhancing system resilience and efficiency [53].

LIMITATIONS

The generalisability of the findings is limited because responses were only received from 50 SHMs in four central level public hospital in Nepal, representing distinct service types and geographical contexts, including urban and rural locations, and specialised facilities such as a children's hospital, maternity hospital, and an infectious disease hospital. Therefore, the result may not be illustrative of all SHMs in central level public hospitals in Nepal. Furthermore, competency assessment relied on self-assessment by participants which may be subject to response bias such as overestimation and underestimation of management competency, leading to errors in self-reported data [28]. Additionally, the relatively small sample size of SHMs may inhibit the ability to robustly assess the internal consistency of MCAP tool using Cronbach's alpha [54].

FURTHER RESEARCH

Further research on different hospital settings and different levels of management may contribute to a better understanding of the competency development requirements for managers in central level public hospitals in Nepal. The open-ended responses revealed complicated issues influencing SHMs performance that expanded beside individual competency. Challenges such as political interference, progression impacted by favouritism, scarce benefits, and substandard working conditions suggest systemic hurdles that warrant closer examination. These barriers further underscore the requirement for qualitative investigation to examine SHMs lived experiences, insights, understanding, and approaches for managing these challenges. Moreover, examining the perceptions of policymakers will also be critical in comprehending the disengagement between governance frameworks and management realities. Future studies should

employ in-depth interviews or focus group discussions to understand the nuanced dynamics at play along with identification of actionable moderators that could support SHMs in effectively fulfilling their roles.

CONCLUSION

Developing SHMs managerial competency is a critical strategic approach to reinforce the efficiency, strength, workability, resilience, stability and sustainability of hospital systems. The study highlights competency gaps among SHMs in areas such as resource management, evidence-based decision making, knowledge on healthcare environment, political acumen, and transition management which further underscores the need for prioritised targeted professional development interventions in these domains. The professional development programs including trainings need to focus on resource allocation, healthcare environment, decision making, political sensitivity, and transition management for equipping SHMs with the competencies necessary to perform their roles effectively and efficiently.

Different learning approaches such as case-based learning and simulated trainings offer valuable opportunities for intensifying evidence-based decision making in conjunction to fostering critical thinking and collaborative problem-solving. These methods are particularly relevant to the complex, policy driven environments that SHMs operate in. The study ultimately underscores that addressing these competency development needs of SHMs through planned, structured and contextually responsive strategies not only strengthens SHMs individual managerial competency but also enhances their organisational performance and resilience. A sustained investment in competency building and development will enable SHMs to negotiate the challenges of contemporary hospital systems with greater confidence and competency. Such development approaches ultimately contribute to the long-term success and sustainability of Nepalese hospital management and healthcare settings.

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PROPRIOCEPTIVE TRAINING AND CONVENTIONAL PHYSICAL THERAPY ON BALANCE AND QUALITY OF LIFE IN PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

OBJECTIVE:

To compare the effects of proprioceptive training and conventional physical therapy on balance and health-related quality of life in patients with diabetic peripheral neuropathy versus conventional physical therapy alone.

METHODS:

This single-blinded, randomised controlled trial was conducted at District Headquarter Hospital, Layyah, Punjab, Pakistan. The sample size of 82 participants was selected through a purposive sampling technique. The control group (A) received conventional physical therapy, including strength training and ROM exercises. The experimental group (B) received proprioceptive training along with conventional physical therapy. Balance was measured using the Berg Balance Scale (BBS), and health-related quality of life by using the Short Form-36 (SF-36). Outcome measures were assessed at baseline, 4th week, and 8th week. An independent sample t-test was used to determine the between-group difference of means. Repeated measure ANOVA was used to analyse within-group mean differences.

RESULTS:

The mean age of participants was 50.72 ± 8.24 years with a mean HbA1c of 6.68 ± 0.72 . The proprioceptive training group showed significantly greater improvements in balance and most SF-36 domains compared to controls ($p < 0.001$). No significant differences were found in role limitations due to physical or emotional health. Higher partial η^2 values (0.83–0.97) indicated strong intervention effects.

CONCLUSION:

The addition of proprioceptive training to conventional physical therapy in the management of patients with diabetic peripheral neuropathy is more effective in improving balance and health-related quality of life than conventional physical therapy alone.

KEYWORDS

balance, diabetic neuropathy, proprioception, physical therapy, quality of life

INTRODUCTION

Diabetic Peripheral Neuropathy (DPN) is one of the complications of diabetes mellitus (DM) resulting from microvascular dysfunction. Almost 50% of individuals with diabetes develop this condition during their lifetime. Its prevalence varies with age, gender, glycaemic control, and type of diabetes [1]. According to a survey, the prevalence of DPN in people living with diabetes is 26.52% in Pakistan [2]. The manifestations of DPN range from no pain to severe pain and sensory impairments [3] that lead to foot ulcers and may cause non-traumatic amputations. Many recent studies have shown an association of cardiovascular risk factors, including obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, and cigarette smoking, in the pathogenesis of DPN [4]. Identifying the modifiable risk factors for developing neuropathy and effectively controlling them at an early stage is critical for successful management and prevention of serious consequences such as ulcers, gangrene, amputation, and accompanying social burden [5].

Diabetic peripheral neuropathy leads to difficulties in balance and coordination due to damage to sensory nerves, reduced tactile stimulation, and loss of proprioception, as well as motor nerve damage that causes weakness, resulting in frequent falls. The most distal parts of the body are the first to be affected by glove and stocking patterns. Furthermore, cognitive decline, particularly in attention, executive function, and dual-tasking ability, exacerbates these sensorimotor deficits, creating a multifactorial pathway to heightened fall risk [6]. These sensorimotor deficits are more predominant in the lower extremities, specifically in the feet, and they lead to disturbances in gait mechanics and impairments in balance [7]. Peripheral neuropathy, present in 50–70% of older patients with diabetes, increases the risk of postural instability, balance problems, muscle atrophy, limiting physical activity, and increasing the risk of falls, which worsen the health-related quality of life [8]. Furthermore, foot problems, including foot ulcerations, partial foot amputation, and trans-tibial amputations, may exacerbate balance disturbances. These individuals also have reduced walking speed, step length, and rhythmic acceleration patterns at the head and pelvis [9]. Therefore, effective interventions targeting balance and functional status may be beneficial in optimising health and well-being [10].

In patients with diabetic peripheral neuropathy (DPN), maintaining good glycemic control and practicing effective self-management are crucial for preserving quality of life. Moreover, factors such as socioeconomic status and education level may also influence overall well-being. Therefore, preventing diabetic complications and effectively managing coexisting chronic conditions remain essential components of comprehensive care for individuals with DPN [11]. Conservative management strategies, including patient education, electrophysical modalities such as transcutaneous electrical nerve stimulation (TENS) and vibration therapy, and therapeutic exercises encompassing range of motion (ROM), strengthening, gait, and balance training, are widely used to reduce neuropathic pain, enhance proprioceptive input, improve muscle strength and joint mobility, and ultimately restore functional balance and mobility in patients with DPN. [12, 13, 14]

Proprioceptive training is a therapeutic exercise intervention designed to improve proprioceptive function. It focuses on using somatosensory signals, such as proprioceptive or tactile afferents, in the absence of information from other modalities such as vision. Its ultimate goal is to improve or restore sensorimotor function to enhance postural balance and control, movement coordination, and reduce the risk of re-injury. [15,16]

Despite established evidence linking proprioceptive training to improved balance and reduced fall risk, its effectiveness relative to conventional physical therapy remains unclear. To address this gap, the present study will compare the effects of a combined proprioceptive and strength training intervention against conventional care on balance and health-related quality of life in a diabetic population.

MATERIALS AND METHODS

This single-blind, randomised controlled trial (RCT) was conducted at the University of Lahore, with data collected from the Department of Physical Therapy at the District Headquarter Hospital in Layyah, Punjab, Pakistan, between December

2021 and September 2022. This study was designed as a superiority trial to evaluate whether proprioceptive training combined with conventional physical therapy is superior to conventional physical therapy alone. Participants were randomised with an allocation ratio of 1:1. This trial was registered on ClinicalTrials.gov (ID: NCT05968131) and follows the Consolidated Standards of Reporting Trials (CONSORT) guidelines as shown in Figure 1 (see appendix). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Research Ethics Committee (REC) of The University of Lahore (REF: REC-UOL-FAHS/997/2021). Informed consent was obtained from all participants after the study's objectives were explained. Data anonymity was ensured, and participants retained the right to withdraw from the study at any time. The sample of 82 participants was calculated using the OpenEpi software by the following formula:

$$n = \frac{2\sigma^2(z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

$Z_{1-\alpha/2}$ Level of significance=95%, μ_1 expected mean change in balance in control group= 54.3 [15], μ_2 expected mean change in balance in interventional group= 49.8 [15], δ_1 expected standard deviation in control group= 6.9, δ_2 expected standard deviation in interventional group= 6.2, $z_{1-\beta}$ power of the study= 80%. The calculated sample size in a group was 34, but after adding 20% dropout, it came out to 34+7=41 in each group.

ELIGIBILITY CRITERIA:

The inclusion criteria of the study were participants aged between 35-65 years, both genders, diagnosed patients of peripheral neuropathy having type-II diabetes, by a registered medical practitioner, Michigan Neuropathy Screening Instrument Questionnaire score of seven or greater [13], and the ability to stand on both feet independently. The exclusion criteria were amputation, inner ear infection, neurological illness that affects balance, including multiple sclerosis, Parkinson's disease, Alzheimer's disease, stroke, and cerebral ataxia [15], musculoskeletal problems such as leg length discrepancy, ankle sprain, and severe osteoarthritis of knee and hip joints [15] and the usage of an orthotic device [17]. Participants who met the predefined eligibility criteria were recruited using non-probability consecutive sampling methods and were subsequently randomised into intervention and control groups by the fishbowl method.

INTERVENTION AND TREATMENT GROUPS:

Individuals in the control group (A) received conventional physical therapy consisting of strengthening and range of motion (ROM) exercises. The targeted movements included knee flexion and extension, ankle dorsiflexion and plantarflexion, ankle inversion and eversion, and toe flexion and extension. Exercises were performed actively through the full range of motion, followed by resistance training using TheraBands with progressively increasing resistance based on individual strength improvement. Each movement was initially performed for 10 repetitions per set, two sets per session, with progression by adding five repetitions every two weeks.

The experimental group (B) received proprioceptive training in addition to the conventional strengthening and ROM exercises described above. The proprioceptive training session began with a 5-minute warm-up consisting of gentle stretches and ended with a 5-minute cool-down involving slow walking. The main intervention was a circuit composed of six exercise stations designed to stimulate the sole and improve gait. Participants stepped alternately on marked ground surfaces, with progression achieved by modifying walking speed and direction.

The circuit was arranged in the following order:

- A 10-cm-thick foam surface
- A wooden box filled with beans
- A 2-cm-thick mat with a lower density than the foam
- A wooden box filled with sand
- A balance board to train lateral balance reactions
- A wooden box filled with cotton

Each patient spent four minutes at each station, for a total proprioceptive training time of 24 minutes. A two-minute rest was provided before starting proprioceptive training, after completion of the ROM and strengthening exercises. [17] The exercises in both groups were supervised by two physiotherapists, each with an average of five years of neurological rehabilitation experience. Training was conducted three times per week on alternate days for eight weeks. The total duration of each session was 45–60 minutes for both groups.

Outcome variables were balance and health-related quality of life measured using the Berg Balance Scale and the short-form-36 questionnaire (SF-36). The Berg Balance Scale (BBS) is a 14-item scale scored from 0 to 56, where higher scores indicate better balance and a score below 45 suggests increased risk of falls.[18] The SF-36 questionnaire measures eight health domains and is scored from 0 to 100, with higher scores reflecting better perceived health status and quality of life.[19] The assessments were conducted at baseline, at the 4th week, and at the 8th week. Intention-to-treat analysis was employed, and the participants were analysed in the same group in which they were randomised. The missing data due to loss to follow-up was managed by the last observation carried out method.

STATISTICAL ANALYSIS:

Data were entered and analysed using SPSS version 26. Numerical variables (e.g., age) were presented as mean $\pm$ standard deviation (SD), while categorical variables (e.g., gender) were expressed as frequency and percentage. The normality of data distribution was assessed using the Kolmogorov–Smirnov test ($n \geq 50$). For between-group comparisons of the mean score of conventional physiotherapy and proprioceptive training on balance and quality of life in individuals with diabetic peripheral neuropathy, an independent-samples t-test was applied. Repeated measures ANOVA was used to evaluate within-group changes across different follow-up points. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of participants was 50.72 ± 8.24 years. The results regarding the gender of participants showed that there were 12% males and 88% females in group A and 44% males and 56% females in group B. There were 8% of subjects who were obese and 3% of subjects who were not obese in group A, while 8% of subjects were obese, 13% and 6% were not obese in group B. The group-wise comparison of demographic details is given in Table 1, and the results showed that the groups are homogenous in baseline characteristics ($p > 0.05$).

TABLE 1: DEMOGRAPHIC DETAILS OF STUDY GROUPS

Variables	Group-A Mean $\pm$ SD	Group-B Mean $\pm$ SD	p-value
Age	51.03 $\pm$ 7.71	50.41 $\pm$ 8.84	0.760
Duration of Diabetes(years)	12.38 $\pm$ 2.82	11.71 $\pm$ 2.65	0.313
HbA1c	6.68 $\pm$ 0.72	6.68 $\pm$ 0.68	1.00
Onset of Symptoms (months)	5.53 $\pm$ 1.60	5.76 $\pm$ 1.82	0.574

The between-group comparisons for balance and health-related quality of life, analyzed using independent sample t-tests, are presented in Table 2. The results revealed that the proprioceptive training group demonstrated statistically significant improvements in balance and several domains of quality of life ($p = 0.001$). These findings indicate that participants in this group experienced enhanced balance with a reduced risk of falls, as well as improved physical function accompanied by reductions in pain and fatigue, leading to greater confidence in mobility. However, no significant between-group differences were observed in the domains related to role limitations due to physical or emotional health. The control group also showed slight improvements over time; the magnitude of change from baseline was substantially greater in the experimental group, demonstrating that proprioceptive training had a meaningful and positive impact on balance and specific aspects of quality of life.

TABLE 2: BETWEEN-GROUP COMPARISON OF BALANCE & HEALTH-RELATED QUALITY OF LIFE

Variables		Measurement	Control Group	Experimental Group	Mean Difference	p-value
Balance		Baseline	13.35±4.07	12.09±4.40	1.267	0.22
		4 th week	18.12±3.50	26.12±2.87	-8.14	<u>0.001</u>
		8 th Week	25.62±2.65	45.38±3.13	-19.76	<u>0.001</u>
Health-Related QoL*	Physical Function	Baseline	34.94±14.67	32.88±6.79	2.05	0.460
		4 th week	42.26±14.59	55.18±11.14	-12.91	<u>0.001</u>
		8 th Week	49.79±14.45	64.53±12.25	-14.74	<u>0.001</u>
	Limitation due to PH*	Baseline	63.03±10.77	65.41±11.41	-2.38	0.38
		4 th week	56.71±9.73	56.09±11.41	0.62	0.81
		8 th Week	49.47±11.81	45.18±10.85	4.29	0.12
	Limitation due to EH*	Baseline	74.62±7.17	74.79±7.83	-0.18	0.92
		4 th week	53.68±4.76	52.91±4.43	0.77	0.50
		8 th Week	36.79±4.32	37.44±5.20	-0.65	0.58
	Fatigue	Baseline	33.59±12.69	33.06±9.43	0.529	0.846
		4 th week	40.76±13.41	55.94±11.37	-15.18	<u>0.001</u>
		8 th Week	46.29±12.29	65.26±11.39	-18.97	<u>0.001</u>
	Emotional Wellbeing	Baseline	46.85±13.63	44.32±6.68	1.85	0.476
		4 th week	54.00±13.42	63.65±10.64	-9.65	<u>0.001</u>
		8 th Week	60.16±12.97	72.85±10.13	-12.71	<u>0.001</u>
	Social functioning	Baseline	51.43±11.14	54.84±11.12	-3.41	0.21
		4 th week	59.09±10.01	64.15±10.23	-5.06	0.04
		8 th Week	64.82±9.62	73.18±9.82	-8.35	0.001
	Pain	Baseline	74.32±7.31	73.09±9.97	1.235	0.562
		4 th week	55.76±8.48	49.41±5.99	6.35	<u>0.001</u>
		8 th Week	38.29±12.85	29.38±5.54	8.91	<u>0.001</u>
	General Health	Baseline	52.29±11.72	55.00±11.56	-2.71	0.34
		4 th week	59.91±11.55	64.44±10.54	-4.53	0.10
		8 th Week	66.12±11.00	73.44±9.97	-7.32	<u>0.01</u>

*QoL= Quality of Life, *PH = Physical Health, *EH = Emotional Health

Table 3 presents the results of the repeated measures ANOVA, indicating that both groups demonstrated significant improvements over time in balance and all domains of the SF-36 ($p < 0.001$ for all comparisons). Pairwise comparisons revealed that the experimental group exhibited greater improvements between baseline and the 8th week compared to the control group. Consistently, the experimental group showed higher partial eta squared (η^2) values (ranging from 0.83 to 0.97) than the control group (ranging from 0.64 to 0.90), suggesting a stronger effect of the intervention. The magnitude of change across all SF-36 domains, including physical function, role limitations, emotional well-being, fatigue, pain, and general health, was markedly superior in the experimental group, demonstrating large effect sizes and greater clinical relevance of the intervention.

TABLE 3: WITHIN-GROUP DIFFERENCE IN BALANCE AND QUALITY OF LIFE

Outcome Measure		Group	Mean Differences with 95% CI	Partial η^2 (group-wise)	p-value
Balance		Control	BL→4th: -4.76, CI: -5.58 to -3.95 4th→8th: -7.50, CI: -8.84 to -6.16 BL→8th: -12.26, CI: -13.96 to -10.57	0.87	<0.001
		Experimental	BL→4th: -14.17, CI: -15.48 to -12.867 4th→8th: -19.11, CI: -20.56 to -17.67 BL→8th: -33.29, CI: -35.36 to -31.22	0.97	<0.001
Health-Related QoL	Physical Function	Control	BL→4th: -7.32, CI: -8.30 to -6.34 4th→8th: -7.52, CI: -8.73 to -6.32 BL→8th: -14.85, CI: -16.56 to -13.13	0.90	<0.001
		Experimental	BL→4th: -22.29, CI: -26.62 to -17.96 4th→8th: -9.35, CI: -10.31 to 8.38 BL→8th: -31.64, CI: -36.04 to -27.24	0.94	<0.001
	Role limitations due to Physical health	Control	BL→4th: 6.32, CI: 4.71 to 7.93 4th→8th: 7.23, CI: 4.86 to 9.60 BL→8th: 13.55, CI: 9.74 to 17.37	0.68	<0.001
		Experimental	BL→4th: 9.32, CI: 8.35 to 10.29 4th→8th: 10.91, CI: 10.01 to 11.80 BL→8th: 20.23, CI: 19.07 to 21.39	0.97	<0.001
	Role limitations due to emotional health	Control	BL→4th: 20.94, CI: 17.82 to 24.05 4th→8th: 16.88, CI: 14.80 to 18.95 BL→8th: 37.82, CI: 35.04 to 40.59	0.96	<0.001
		Experimental	BL→4th: 21.88, CI: 18.45 to 25.31 4th→8th: 15.47, CI: 12.67 to 18.26 BL→8th: 37.35, CI: 34.27 to 40.43	0.94	<0.001
	Fatigue	Control	BL→4th: 5.52, CI: 3.28 to 7.77 4th→8th: 7.17, CI: 5.82 to 8.53 BL→8th: 12.70, CI: 10.00 to 15.40	0.80	<0.001
		Experimental	BL→4th: 9.32, CI: 8.35 to 10.29 4th→8th: 22.88, CI: 19.01 to 26.74 BL→8th: 32.20, CI: 28.58 to 35.82	0.96	<0.001
	Emotional Wellbeing	Control	BL→4th: -7.82, CI: -9.13 to -6.51 4th→8th: -6.14, CI: -6.59 to -5.70 BL→8th: -13.97, CI: -15.45 to -12.48	0.96	<0.001
		Experimental	BL→4th: -19.32, CI: -22.51 to -16.13 4th→8th: -9.20, CI: -10.11 to -8.29 BL→8th: -28.52, CI: -31.61 to -25.44	0.95	<0.001
	Social Functioning	Control	BL→4th: -7.66, CI: -8.67 to -6.64 4th→8th: -5.73, CI: -6.21 to -5.25 BL→8th: -13.39, CI: -14.64 to -12.14	0.95	<0.001
		Experimental	BL→4th: -9.30, CI: -10.11 to -8.50 4th→8th: -9.02, CI: -9.91 to -8.14 BL→8th: -18.33, CI: -19.74 to -16.92	0.95	<0.001
	Pain	Control	BL→4th: 18.55, CI: 15.36 to 21.75 4th→8th: 17.47, CI: 12.77 to 22.16	0.89	<0.001

			BL→8th: 36.02, CI: 31.17 to 40.88		
		Experimental	BL→4th: 23.67, CI: 20.50 to 26.84 4th→8th: 20.02, CI: 17.79 to 22.26 BL→8th: 43.70, CI: 39.89 to 47.51	0.94	<0.001
	General Health	Control	BL→4th: -7.61, CI: -8.50 to -6.72 4th→8th: -6.20, CI: -6.83 to -5.58 BL→8th: -13.82, CI: -14.95 to -12.68	0.95	<0.001
		Experimental	BL→4th: -9.44, CI: -10.25 to -8.62 4th→8th: -9.00, CI: -9.88 to -8.11 BL→8th: -18.44, CI: -19.85 to -17.03	0.95	<0.001

DISCUSSION

This study aimed to compare the effects of proprioceptive training in addition to conventional physical therapy on balance and quality of life in patients with diabetic peripheral neuropathy (DPN). The findings demonstrated significant improvements in both groups after intervention; however, participants receiving proprioceptive training showed greater gains in balance control and in several domains of health-related quality of life, including general health, physical functioning, emotional well-being, pain, and fatigue. These results indicate that proprioceptive training enhances postural stability and overall functional confidence during daily activities.

The observed benefits align with previous literature highlighting the value of proprioceptive training in restoring sensorimotor function. Exercises performed on unstable or varied surfaces stimulate reweighting of sensory inputs and improve somatosensory integration, ultimately enhancing balance and motor learning. El-Wishy and Elsayed [20] conducted a randomized controlled trial in Egypt and reported a highly significant improvement in balance ($p < 0.001$) following eight weeks of proprioceptive training delivered through multiple exercise stations. Similarly, Ahmad et al. [21] found significant improvements in both static and dynamic balance ($p < 0.05$) among middle-aged and older adults with diabetic neuropathy after eight weeks of proprioceptive and sensorimotor interventions. Consistent results were also observed by Malwanage et al. [22], who reported that 12 weeks of proprioceptive training effectively restored static and dynamic proprioceptive deficits of the lower limb.

Evidence from prior studies also supports the effectiveness of conventional therapeutic exercises such as strengthening, gait, and balance training in improving function among individuals with DPN. A Japanese trial involving 53 participants demonstrated that eight weeks of home-based strengthening exercises improved activities of daily living and functional independence [23]. Likewise, a 12-week program focusing on gait, balance, and fear of falls in 71 participants with diabetic neuropathy led to significant improvements in walking speed, muscle strength, and balance ($p < 0.002$) compared with controls [24]. These findings emphasize the importance of distal muscle strengthening in reducing fall risk and enhancing postural stability.

Taken together, the evidence suggests that both strengthening and proprioceptive training independently enhance balance and quality of life in patients with DPN. However, when combined, as in the present study, they appear to produce superior outcomes by targeting both muscular strength and sensorimotor control. Clinically, this integrated approach may reduce fall risk, promote functional independence, and improve overall well-being in individuals with diabetic peripheral neuropathy.

There are a few limitations to this study. It was conducted in a single center, which may limit the generalizability of the findings. Moreover, the intervention period and assessments were limited to eight weeks, with no long-term follow-up to determine the sustainability of improvements. The outcome measures used were primarily subjective in nature. Therefore, future research is recommended to evaluate the long-term effects of proprioceptive training on additional aspects of

lower limb function, including gait, using objective measurement tools and exploring its applicability to other types of neuropathies.

CONCLUSION

Proprioceptive training combined with conventional physical therapy was more effective than conventional therapy alone in improving balance, physical function, fatigue, and overall quality of life in patients with diabetic peripheral neuropathy.

Healthcare professionals can incorporate these interventions into rehabilitation or prevention strategies, particularly for individuals at risk of falls. This dual intervention approach holds the potential for holistic enhancements in diverse health aspects, thereby positively influencing the overall quality of life for those undergoing such interventions.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE:

The ethical approval of the study was obtained from the Ethical Review Committee of The University of Lahore (Ref No.: IRB-UOL-FAHS/997/2021). Consent to participate in the study was obtained from all the participants at the time of recruitment.

CONSENT FOR PUBLICATION:

Permission to publish the findings of the study was sought from every participant.

AVAILABILITY OF DATA AND MATERIALS:

All the available data can be shared upon request with the authors of the study.

COMPETING INTERESTS:

There are no competing interests in the study.

FUNDING:

No funding was available for this study.

AUTHORS' CONTRIBUTIONS:

SN contributed to the Study concept, design, and data collection. AJ provided the Concept of Study, Literature Review, Data Analysis, Writing the Manuscript, and the Final review. SA contributed to Data Analysis and Interpretation, and approval of the final version. ST contributed to the Literature Review and finalisation of the manuscript. SA (Akram) contributed to the Literature Review and finalisation of the manuscript. All authors have reviewed and approved the final version of the manuscript.

ACKNOWLEDGEMENTS:

We are grateful to the University Institute of Physical Therapy, University of Lahore, District Headquarter Hospital, Layyah, and our mentors and colleagues for providing us with the opportunity to project our studies in the best possible way.

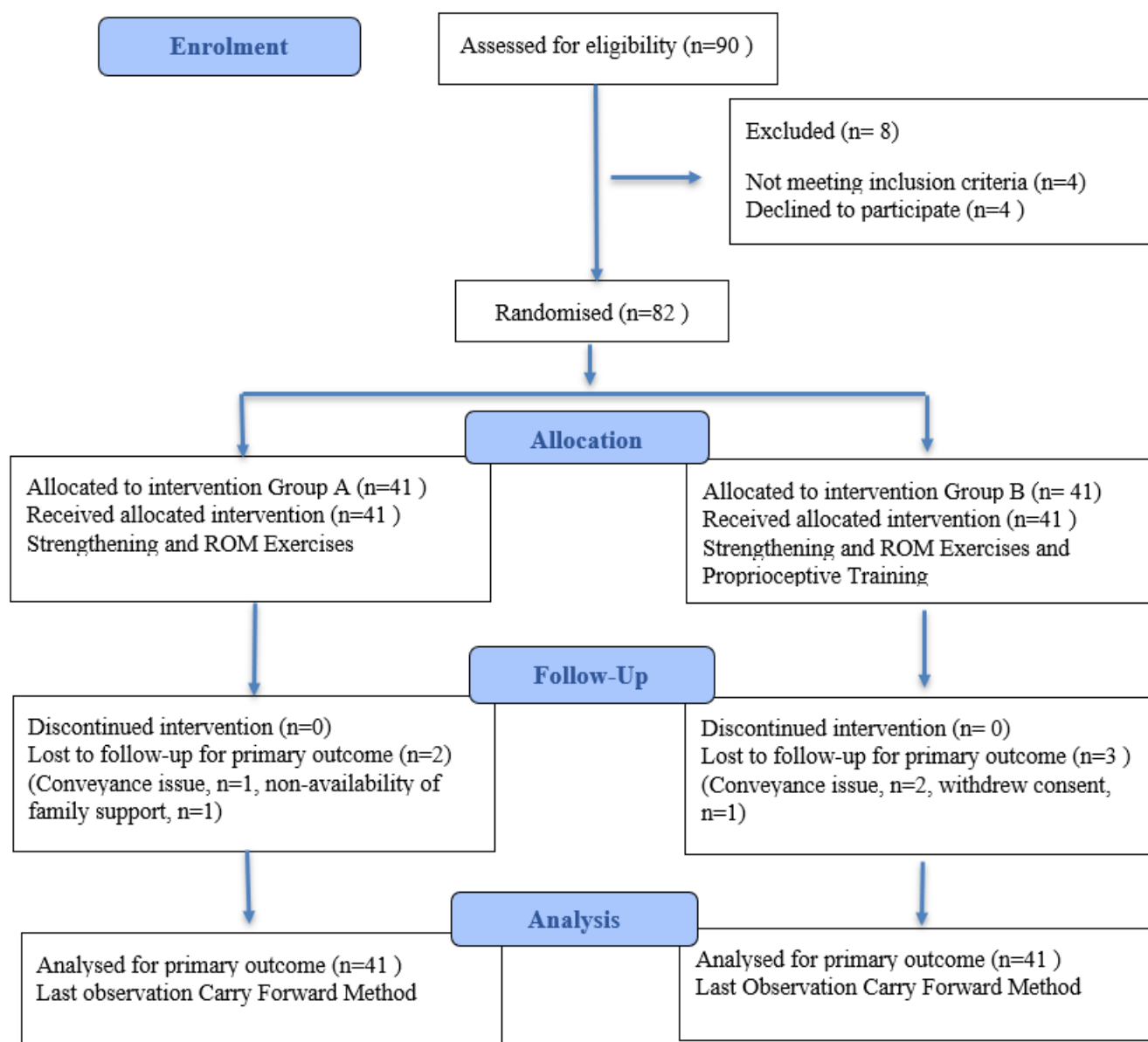
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APPENDIX

FIGURE 1: CONSORT 2025 FLOW DIAGRAM



THE EFFECT OF HEALTHCARE COMMUNICATION ON PATIENT SATISFACTION IN INDIVIDUALS APPLYING TO EMERGENCY SERVICE

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ABSTRACT

OBJECTIVE:

This study aims to examine the impact of healthcare communication on patient satisfaction among individuals utilizing emergency services. Specifically, it focuses on understanding how the communication process during patients' most recent emergency department visits influences their satisfaction levels.

METHODS:

The study was conducted among individuals aged between 18 and 65 years who had applied to an emergency service within the past year in Türkiye. To assess patient satisfaction, the Emergency Service Patient Satisfaction (ESPS) Scale was utilized, and the Healthcare Communication (HC) Scale was employed to evaluate participants' perceptions of communication during their emergency care experience. The study analyzed demographic data from 579 participants, and simple linear regression analysis was used to determine the relationship between healthcare communication and patient satisfaction.

RESULTS:

The regression analysis revealed a statistically significant and positive relationship between healthcare communication (HC) and emergency service patient satisfaction (ESPS) ($p < 0.05$). It was found that healthcare communication accounts for 11.4% of the variance in patient satisfaction with emergency services ($R^2 = 0.114$). Moreover, each one-unit increase in healthcare communication resulted in a 0.337-unit increase in patient satisfaction perception ($\beta = 0.337$).

CONCLUSION:

The findings demonstrate that effective healthcare communication significantly enhances patient satisfaction in emergency service settings. These results underscore the importance of developing and strengthening communication skills among healthcare professionals as a strategic approach to improving patient satisfaction. Furthermore, focusing on communication processes can contribute substantially to enhancing the overall quality of emergency healthcare services.

KEYWORDS

patient satisfaction, emergency service, healthcare communication

INTRODUCTION

Patient satisfaction is the principal measure of quality in the delivery of health services and a prerequisite for high-quality service [1,4]. Determining patient satisfaction as the first goal in the provision of health services helps health institutions to improve service quality [5,6]. In other words, patient satisfaction is a patient-centered concept that measures their satisfaction with healthcare [7]. In the treatment process, it is essential to improve patient satisfaction, manage their expectations effectively, and minimize the factors that may negatively affect their experience [8]. Patient satisfaction is one of the important quality indicators in healthcare services [9]. When the quality of service in health can be improved by identifying existing problems and defects, the level of patient satisfaction can also be increased [10].

Hospital emergency departments are one of the most basic and critical departments of healthcare services and have a vital function in terms of public health. It is necessary to respond quickly and effectively to the immediate healthcare needs of patients in emergency services [11,12]. The hospital emergency room is a department where first aid and necessary care services are provided to patients applying for unplanned and urgent situations [13,14]. The importance of emergency services in health services stems from the fact that they provide fast and effective health services that individuals need in sudden health problems and life-threatening situations [15]. Since the emergency department is generally a chaotic, hectic environment where immediate healthcare needs are met, patient satisfaction may vary according to the patient's experience [16,17]. Regarding patient satisfaction, the interaction between the health service provider and the patient is very important in the emergency department. Because the emergency department is a stressful, risky environment that requires rapid decision-making and implementation, strong communication is crucial in emergency medical care services [18,19]. In other words, effective communication in healthcare processes will positively affect patient satisfaction [20,21]. For instance, patients may experience negative feelings because of treatment-related issues, delays, or unanticipated outcomes. Nonetheless, educating patients about these circumstances beforehand and explaining the procedure helps to mitigate adverse effects [8,22]. The relationship between patient satisfaction and health communication has a multi-layered structure that can be explained by multiple theoretical approaches. In this context, the Expectancy–Disconfirmation Theory suggests that the difference between patients' expectations prior to receiving healthcare services and their experiences after receiving such services determines their level of satisfaction. Effective communication can balance this difference, preventing dissatisfaction and improving perceived service quality. The Social Exchange Theory, on the other hand, defines the healthcare process within the framework of mutual benefit and trust; according to this approach, open and empathetic communication between patients and healthcare professionals ensures that the interaction is perceived as fair and satisfying. As key elements within patient-centered communication models, openness, active listening, respect, information sharing, and joint decision-making processes are highlighted as crucial factors that boost patient satisfaction. In high-pressure settings like emergency departments, strong communication from healthcare professionals builds trust and boosts patient satisfaction by addressing emotional needs. In line with these theoretical approaches, effective healthcare communication is not merely about information transfer but is also considered a decisive factor in shaping the patient experience and building satisfaction.

Effective communication in health services is essential to ensure patient satisfaction [23,25]. Effective communication between patients and healthcare providers helps to improve healthcare outcomes [25,26]. Effective healthcare communication plays a significant role as part of patient satisfaction-centered care in health services. Creating an environment of trust by understanding the concerns of patients in hospitals and approaching them empathically can increase the success of treatment processes and positively affect patient satisfaction [16,24]. At the same time, patients in the emergency department are often agitated, frightened, or in pain. For this reason, calm and courteous communication of the staff in the emergency department is welcomed by the patients. Effective communication in the emergency department contributes positively to the diagnosis and treatment process of patients and improves the management of stressful situations by facilitating the work of healthcare professionals [2,27]. Practical communication skills are competencies that can enhance the quality of the relationship between patient and physician in the provision of emergency health services. Coupled with clear and direct empathy, effective communication can foster a positive perception among patients, leading to satisfaction and loyalty [19]. Effective and consistent communication has a

favorable impact on the treatment experience. Patients who are better educated about their treatment process through communication are more likely to feel confident and involved. As a result, recognizing and managing patients' expectations is critical to their happiness with the treatment process. Effective communication and constant information sharing help to mitigate negative patient perceptions about their medical treatment experience by boosting their active engagement in the treatment process [8,28].

This study aims to make a substantial contribution to the literature by investigating the crucial role of healthcare communication in enhancing the satisfaction of individuals who visit the emergency department for healthcare services. Given that patient satisfaction is a key indication in determining the quality of healthcare, the study's findings could be used to build communication strategies and improve patient experiences in emergency rooms. What makes this study unique and different is that it focuses on the dynamics of health communication in a high-pressure context such as emergency health services, which is often overlooked in existing research on patient satisfaction. While much literature discusses general factors influencing patient satisfaction, there's a limited number of systematic studies on how real-time communication affects perceived service quality in high-stress environments like emergency departments. This study fills an important gap in the literature by focusing on individuals' most recent emergency department visit experiences and providing context-specific data. Additionally, it offers practical implications for improving healthcare professionals' communication skills, which are critical for enhancing both clinical outcomes and patient trust in acute care settings.

METHODS

POPULATION AND SAMPLE

A quantitative research technique was employed in the study. The target population consisted of individuals aged 18–65 living in Turkey who had applied to an emergency department within the past year. According to the Turkish Statistical Institute [29], this age group comprises approximately 65% of the population, or about 55 million people. The sample size was calculated using the formula $n = t^2 \times p \times q / d^2$, with parameters set at $p = 0.5$, $q = 0.5$, $t = 1.96$, and $d = 0.05$, resulting in a minimum required sample of 384 participants. However, a total of 579 participants were ultimately reached. This was a deliberate choice, based on the assumption that increasing the sample size would enhance statistical power and improve the generalizability of the findings. Especially in survey-based research, a larger sample size reduces the margin of error and enhances the reliability of multivariate analyses such as regression and correlation. Furthermore, a broader sample allows for subgroup comparisons across demographic variables such as age, gender, and education level. During the data collection process, it was anticipated that there might be invalid or incomplete responses; therefore, a wider target group was initially reached. As no invalid data was detected, the analyses were conducted using all 579 valid responses. Accordingly, the final sample size strengthens the statistical representativeness of the study and contributes to achieving more robust and reliable results.

DATA COLLECTION TOOLS

In this study, data were collected using a structured questionnaire technique. The questionnaire, administered online to participants, consisted of three main sections: a Personal Information Form, the Emergency Service Patient Satisfaction (ESPS) Scale, and the Healthcare Communication (HC) Scale. Each of these tools is described in detail below.

PERSONAL INFORMATION FORM

The first section of the questionnaire included a Personal Information Form designed to gather basic demographic data about the participants. This section contained closed-ended questions related to variables such as age, gender, marital status, education level, and monthly income. These variables were used to provide a descriptive profile of the sample and to conduct subgroup analyses when necessary.

EMERGENCY SERVICE PATIENT SATISFACTION SCALE

To assess patient satisfaction among individuals who had utilized emergency department services, the study employed the Emergency Service Patient Satisfaction (ESPS) Scale. Originally developed by Atari (2015), the Turkish adaptation and validation of the scale were conducted by Konateke and Yilmaz (2022). The EPS is a 5-point Likert-type scale composed

of 18 items distributed across five sub-dimensions: Nurse Satisfaction, Admission Staff Satisfaction, Emergency Department Environment, Physician Care Satisfaction, and General Patient Satisfaction. The internal consistency of the original scale was confirmed with a Cronbach's alpha coefficient of 0.940, indicating excellent reliability [30,31].

HEALTHCARE COMMUNICATION SCALE

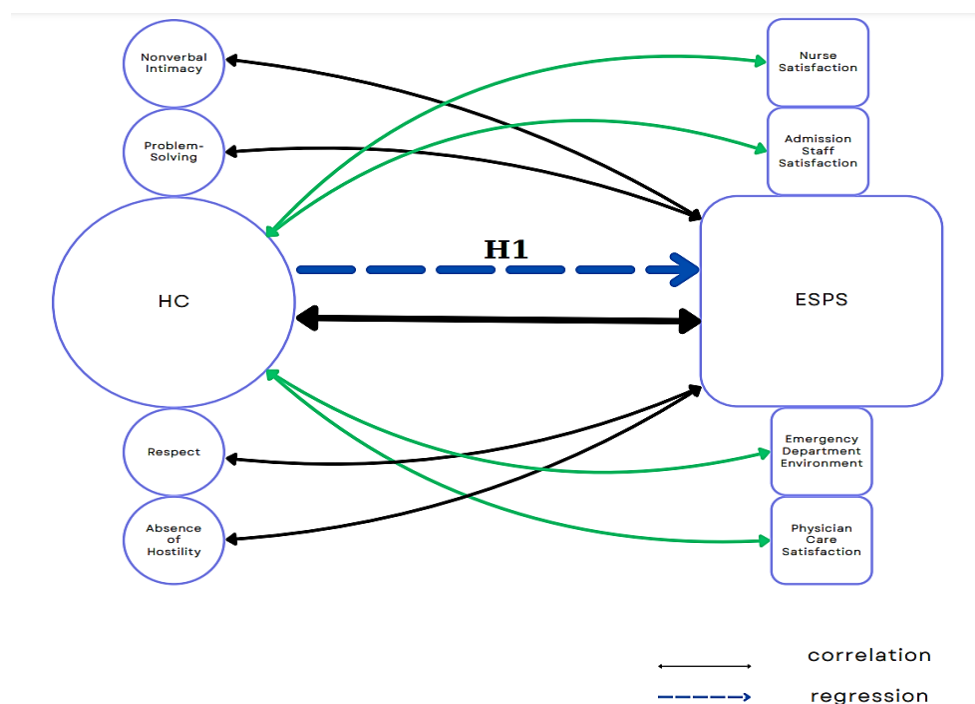
The level and quality of communication between patients and healthcare professionals were evaluated using the Healthcare Communication Scale (HC), originally developed by Gremigni et al. (2008). The Turkish version of the scale was validated by Kalkan and Özbaş (2021). The scale comprises 13 items and is structured around four sub-dimensions: Nonverbal Intimacy, Problem-Solving, Respect, and Absence of Hostility. The reliability analysis of the Turkish version yielded a Cronbach's alpha of 0.83, indicating a high level of internal consistency [32,33].

RESEARCH MODEL AND HYPOTHESIS

The conceptual model of the study is presented in Figure 1. This model illustrates the hypothesized effect of healthcare communication on patient satisfaction among individuals who applied to emergency departments. Within this framework, hypothesis 1 (H¹) was tested through linear regression analysis to determine the predictive power of healthcare communication on overall patient satisfaction. Additionally, the associations between the sub-dimensions of the scales were examined using Pearson correlation analysis, providing a more detailed understanding of the relational dynamics between communication behaviors and satisfaction outcomes.

H¹: Healthcare communication has a statistically significant and positive effect on patient satisfaction among individuals who apply to emergency services.

FIGURE 1. RESEARCH MODEL



STATISTICAL ANALYSIS

Data collected in this study, investigating the effect of healthcare communication on patient satisfaction in emergency service applicants, were analyzed using SPSS 21 (Statistical Package for the Social Sciences) and JASP 0.19 software. The results were then reported. For the research findings, the data were first analyzed for normality, and skewness and kurtosis coefficients were examined. The research data was checked for normality and, showing a normal distribution, allowed for the application of parametric tests. Pearson Correlation analysis was performed to examine the relationships and then simple linear regression analysis was performed to assess the measured effect.

ETHICAL CONSIDERATIONS

Prior to the study, the necessary permissions were obtained by applying to Selcuk University Faculty of Health Sciences Non-Interventional Clinical Research Ethics Committee in May 2024 (Decision number: 2024/478).

RESULTS

The results and statistical interpretations of the analyses are provided as a consequence of the data analysis conducted.

TABLE 1. DESCRIPTIVE CHARACTERISTICS OF PARTICIPANTS

Demographic Characteristics	Groups	N	%
Gender	Female	310	53.5
	Male	269	46.5
Age	18-33	245	42.3
	34-49	185	32.0
	50-65	149	25.7
Educational Status	Primary School	88	15.2
	High School	171	29.5
	Graduate	181	31.3
	Postgraduate	139	24.0
Health Status	Poor	134	23.1
	Middle	278	48.0
	Good	168	28.8
Income Status	Low	118	20.4
	Middle	293	50.6
	High	168	29.0
Total		579	100.0

The descriptive characteristics of 579 individuals participating in the study were analyzed through frequency (n) and percentage (%) values. According to the age variable, 42.31% of the participants were between 18-33, 31.95% between 34-49, and 25.73% between 50-65. In terms of gender variable, it was observed that 53.55% of them were female and 46.45% were male. According to educational status, 15.19% of them had primary school education, 29.53% had high school education, 31.26% had undergraduate education, and 24.0% had graduate education. When their health status was analyzed, it was observed that 20.38% had poor health status, 50.60% had moderate health status, and 29.01% had good health status. Lastly, according to the table, 20.4% of the participants are in the low-income group, 50.6% are in the middle-income group, and 29.0% are in the high-income group (Table 1).

TABLE 2. NORMALITY AND DESCRIPTIVE STATISTICS OF THE SCALES

Scales	Median	IQR	Skewness		Kurtosis	
Normality test			Statistic	Std error	Statistic	Std error
ESPS	2.88	0.66	-.413	.102	-.373	.203
HC	3.15	1.00	.030	.102	-1.337	.203
		N of Items	Cronbach alpha (α)	X	SD	
Reliability Test and Descriptive Statistics	ESPS	18	0.74	2,85	.372	
	HC	13	0.75	3,15	.482	

ESPS: Emergency Service Patient Satisfaction, HC: Healthcare Communication

When the normality of the scales is examined, the skewness and kurtosis coefficients fall within the acceptable range of ± 1.5 , indicating that the data are approximately normally distributed (Tabachnick et al., 2013). Furthermore, the median and interquartile range (IQR) values provide additional descriptive insight, with median scores of 2.88 (ESPS) and 3.15 (HC), and IQRs of 0.66 and 1.00, respectively. The mean and standard deviation values were calculated as 2.85 (SD = 0.372) for the ESPS scale and 3.15 (SD = 0.482) for the HC scale, suggesting moderate levels of patient satisfaction and perceived healthcare communication. In terms of reliability, Cronbach's alpha values were 0.74 for the ESPS scale and 0.75 for the HC scale, indicating acceptable but not high. These findings confirm that the scales used in the study are appropriate for further statistical analyses (Table 2).

TABLE 3. COMPARISON OF EMERGENCY SERVICE PATIENT SATISFACTION AND HEALTHCARE COMMUNICATION BY SOCIODEMOGRAPHIC VARIABLES

Scales		Variables										
		Age			Gender		Income Status			Health Status		
		18-33	34-49	50-65	Female	Male	Poor	Middle	Good	Poor	Middle	Good
ESPS	X $\pm$ Sd	2,86	2,77	2,93	2,94	2,74	2,76	2,79	3,01	2,94	2,82	2,81
	F/t	7,901			6,867		26,289			6,113		
	p	,000			,000		,000			,002		
HC	X $\pm$ Sd	3,12	3,18	3,15	3,21	3,07	3,21	3,14	3,12	3,05	3,23	3,10
	F/t	0,895			3,554		1,168			7,649		
	p	0,409			,000		,312			,001		

ESPS: Emergency Service Patient Satisfaction, HC: Healthcare Communication

The table examines whether ESPS and HC scores differ significantly according to age, gender, income level, and general health status. ESPS scores show significant differences based on age ($F = 7.901$, $p < .001$), gender ($t = 6.867$, $p < 0.001$), income level ($F = 26.289$, $p < 0.001$), and general health status ($F = 6.113$, $p = 0.002$). The highest satisfaction scores were observed among individuals aged 50 and over, female participants, those with higher income levels, and individuals with poor health status. Regarding HC, no significant differences were found based on age ($F = 0.895$, $p = 0.409$) and income level ($F = 1.168$, $p = 0.312$), while significant differences were observed in relation to gender ($t = 3.554$, $p < 0.001$) and general health status ($F = 7.649$, $p = 0.001$). Female participants and those with moderate health status reported higher healthcare communication perceptions. These findings indicate that both patient satisfaction and healthcare communication perceptions vary significantly according to sociodemographic characteristics (Table 3).

TABLE 4. CORRELATION ANALYSIS FOR SCALES AND SUB-DIMENSIONS

Pearson Correlation (Scales and Sub-Dimensions)		Pearson's r	p
ESPS (General)	HC (General)	0.337	<.001
ESPS (General)	HC Nonverbal Intimacy	0.277	<.001
	HC Problem-Solving	-0.255	<.001
	HC Respect	0.340	<.001
	HC Absence of Hostility	0.419	<.001
HC (General)	ESPS Nurse Satisfaction	0.266	<.001
	ESPS Admission Staff Satisfaction	0.046	0.267
	ESPS Emergency Department Environment	0.250	<.001
	ESPS Physician Care Satisfaction	0.235	<.001
	ESPS General Patient Satisfaction	0.209	<.001

ESPS: Emergency Service Patient Satisfaction, HC: Healthcare Communication

Table 4 presents the Pearson Correlation analysis results for the general average scores of ESPS and HC, as well as their sub-dimensions. The analysis revealed a moderate positive significant relationship between the overall ESPS score and HC

($r=0.337$; $p<0.01$). A moderate positive significant relationship was found between the 'Respect' and 'Absence of Hostility' sub-dimensions of HC and the overall ESPS score ($r=0.340$, $r=0.419$; $p<0.01$). A weak positive significant relationship was found with 'Nonverbal Intimacy', and a weak negative significant relationship with 'Problem-Solving' ($r=0.277$, $r=-0.255$). A weak positive significant relationship was observed between overall HC and ESPS sub-dimensions such as 'Nurse Satisfaction' ($r=0.266$), 'Emergency Department Environment' ($r=0.250$), 'Physician Care Satisfaction' ($r=0.235$), and 'General Patient Satisfaction' ($r=0.209$) ($p<0.01$). However, no significant relationship was found with 'Admission Staff Satisfaction' (Table 4).

TABLE 5. THE EFFECT OF HEALTHCARE COMMUNICATION ON EMERGENCY SERVICE PATIENT SATISFACTION

Variables		Unstandardized Coefficients		Standardized Coefficients	t	p	F	R ²
Dependent Variable	Independent Variable	B	Std. Error	Beta				
ESPS	Constant	2.027	0.096	0.337	21,00			
	HC	0.261	0.030		8,607	0.000*	74,072	0.114

$R=0.337$; * $p<0.01$

Regression analysis results for the effect of HC on ESPS are given in Table 5. The simple linear regression analysis between the ESPS and the HC yielded significant results. ($p < 0.05$). 11.4% of the change in the dependent variable, ESPS, can be explained by healthcare communication ($R^2=0.114$). Furthermore, a 1-unit increase in healthcare communication leads to a 0.337-unit increase in the perception of ESPS ($\beta=0.337$). As a result of regression analysis, Hypothesis 1 was accepted (Table 5).

When the findings obtained were evaluated, it was seen that healthcare communication had a significant effect on patient satisfaction in patients applying to the emergency department. It was concluded that effective communication and information sharing with healthcare professionals, especially in busy and stressful environments such as emergency services, can increase satisfaction by contributing to patients feeling safe.

DISCUSSION AND CONCLUSION

In our study conducted on individuals aged 18-65 years who applied to the emergency department in Türkiye, it was determined that healthcare communication had a significant effect on emergency department patient satisfaction. In addition, various studies supporting these findings in the literature were also analyzed. In another study, it was pointed out that the fact that emergency services are very busy and crowded can have negative consequences on patient satisfaction and that communication factors should be utilized effectively to prevent this situation [22]. A study on emergency department readmissions and discharges found that effective communication interventions led to better treatment outcomes, shorter waiting times, and improved treatment compliance. This, in turn, was linked to higher patient satisfaction and fewer hospital readmissions [9]. In a study examining patient satisfaction in the emergency department in Portugal, it was emphasized that the main determinant of patient satisfaction is the communication between the patient and healthcare professionals. Researchers have focused on the importance of identifying ways to improve this interaction and emphasized the need to seek solutions for improvement [34]. In a study examining the emergency department experiences of disadvantaged individuals who applied to the emergency department, it was concluded that they tended to avoid and distrust health services due to the miscommunication and lack of understanding they experienced [35]. In a study on effective communication skills training between patients and health professionals, it was concluded that in addition to ensuring patient satisfaction, quality outcomes and cost-effectiveness was also improved [28]. In addition to these studies, studies on the importance of communication in crisis and extraordinary situations in healthcare are frequently included in the literature. Especially during the Covid-19 pandemic, there was an extraordinary intensity in these areas with the increasing demand for intensive care and emergency health services. This has shown that

ensuring effective and effective communication plays a critical role in reducing the devastating effects of the disease. During the COVID-19 pandemic, several studies [36,40] examined the contribution of effective communication not only to patient satisfaction but also to preventing disease spread, accelerating treatment processes, and reducing mortality rates. Although conducted in different contexts and with various methods, these studies supported similar results.

The intensity of emergency services, which play a significant and critical role in healthcare, is increasing daily and can disrupt work processes in some circumstances. Healthcare workers bear significant responsibility in this field, which must be carried out with the utmost professionalism. By forming deep links with patients presenting to the emergency department, effective communication can help to overcome the service's challenges. As a result of this study, the effect of healthcare communication on patient satisfaction in individuals seeking emergency department care has been investigated, and it has been determined that there is a significant positive relationship, and a higher level of patient satisfaction is achieved as healthcare communication improves. This study was conducted on a specific sample in Turkey, and it is believed that similar studies should be conducted across different health facilities, and any communication issues should be addressed by emphasizing patient satisfaction, which is an indicator of quality. From a health policy perspective, the findings of this study suggest several practical implications for improving emergency care services. Strengthening healthcare communication skills among emergency department personnel should be integrated into national health strategies, particularly in countries with high patient density in emergency units. Policymakers should prioritize structured training programs that promote effective, patient-centered communication to reduce dissatisfaction, improve treatment outcomes, and minimize repeated admissions. Additionally, communication-based performance metrics can be included in quality monitoring systems for emergency departments. By doing so, communication will not only be perceived as an interpersonal skill but also as a measurable component of healthcare quality. These implications underline the importance of transforming research results into actionable strategies that inform decision-making processes in healthcare systems.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study aimed to examine the effect of healthcare communication on patient satisfaction among individuals admitted to emergency services; however, it has certain limitations that should be acknowledged. First, the study was limited to individuals aged between 18 and 65 years who applied to emergency departments within the last year in Türkiye. Therefore, the generalizability of the findings is limited, and groups such as older adults or patients with chronic illnesses were not included in the scope of this research. For future research, it is recommended to conduct similar studies on broader and more representative samples, including different age groups and diverse socioeconomic backgrounds. Moreover, employing mixed method designs that incorporate qualitative approaches may offer deeper insights into the relationship between healthcare communication and patient satisfaction. Longitudinal studies could also explore how healthcare communication affects patient satisfaction over time. Finally, conducting comparative analyses across different types of healthcare institutions (public, private, university hospitals) and various professional groups (physicians, nurses, paramedics) may provide a more comprehensive understanding of how healthcare communication impacts patient satisfaction in diverse settings. In addition, future research may benefit from developing theory-driven frameworks that incorporate mediating or moderating variables such as health literacy, patient empowerment, or institutional trust. Employing validated multi-dimensional scales and advanced statistical methods (e.g., SEM, multi-group analysis) may also enhance the methodological rigor of future studies. "Investigating contextual factors like organizational culture, digital communication tools, or time constraints in emergency departments could yield specific evidence for clinical practices and health policies."

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REMOTE PATIENT HEALTHCARE: BEHAVIORAL AND CULTURAL DETERMINANTS IN TELEMEDICINE AND DIGITAL HEALTH PLATFORMS

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ABSTRACT

PURPOSE:

The current research analyzes the most important behavioral factors and cross-cultural factors that influence the adoption of virtual doctor consultations. The combination of behavioural and cultural approaches provides a stream of research that fills existing gaps in telehealth acceptance and provides practical implications in designing user-centred digital health solutions.

METHODS:

To develop a literature review (SLR) synthesis of the literature, this study utilized a systematic review of the literature in the fields of healthcare, psychology, business, and sociology and thus developed an integrative theoretical framework of telemedicine adoption. The review has critically analyzed empirical studies in order to establish the cognitive, emotional, social and contextual variables that affect the adoption behavior of users.

THEORETICAL SYNTHESIS:

The analysis, based on the existing frameworks, such as Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), and Unified Theory of Acceptance and Use of Technology (UTAUT) summarizes the existing and new determinants of telemedicine usage. Besides performance expectancy, effort expectancy and facilitating conditions, the study highlights new behavioural aspects, including trust, perceived risk, contamination avoidance, psychological predispositions, habitual behaviour, and perceived severity of illness, which play a significant role in the engagement of users to virtual healthcare services.

CONCLUSION:

The research hypothesizes a model that brings together behavioural, cultural, and emergent digital-health views and leads to developing the theoretical knowledge about the adoption of telemedicine. The results provide evidence-based recommendations to researchers, clinicians, and policy-makers aiming to make telemedicine more accessible, develop user trust, and ensure the adoption of telemedicine among culturally diverse groups of people.

KEYWORDS

Telemedicine, digital healthcare platforms, behavioral and cross cultural, theoretical model, virtual healthcare services adoption.

INTRODUCTION

The rise of virtual doctor consultations has been a significant development in the digital transformation of healthcare, allowing patients to access medical services remotely. Telemedicine, along with AI and digital health platforms, aims to enhance the accessibility, affordability, and effectiveness of healthcare [1]. The COVID-19 pandemic accelerated this shift, compelling both healthcare providers and patients to opt for virtual consultations instead of traditional in-person visits [17]. However, despite the advantages, the uptake of virtual consultations remains limited due to various behavioral and psychological factors. Behavioral theories such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) indicate that factors like perceived usefulness, ease of use, trust, and technological self-efficacy play a crucial role in the adoption of digital health solutions [29]. Concerns regarding data privacy, the need for physical examinations, and trust in technology-mediated interactions also pose barriers to adoption [13]. To develop effective telehealth policies and engage patients, it is essential to understand these behavioral factors. An important yet often overlooked aspect of virtual healthcare acceptance is the influence of cross-cultural factors. Elements such as individualism versus collectivism, uncertainty avoidance, and power distance can shape attitudes toward digital healthcare [9;24]. For instance, cultures with high power distance may prefer direct interactions with authoritative medical professionals rather than virtual consultations, while individualistic cultures might lean towards self-service healthcare options. Additionally, regional differences in technological literacy, legal frameworks, and social norms can impact trust in digital platforms [25]. This study aims to explore the behavioral determinants and cross-cultural influences affecting the adoption of virtual doctor consultations. By integrating behavioral and cultural perspectives, it seeks to address the global gaps in telehealth adoption and provide practical recommendations for enhancing user acceptance across diverse cultural contexts.

Additional evidence highlights the need to interpret telemedicine adoption in the context of real-world trends and system capacity. For example, World Health Organization (2021) show that 83% of high-income countries adopted telehealth policies during COVID-19, while only 50% of low-income countries do so, signifying a gap in the infrastructure and user preparedness oriented to digital health systems. Even in India, the eSanjeevani platform launched by the government has been conducting more than 200,000 consultations daily by mid-2022, demonstrating the acceptance of the modality when structural and behavioral facilitators coincide [34]. Assignment of Digital Health to the General Population However, despite these auspicious signs, research shows that persisting gaps remain in how digital health is being used by the population, particularly for older, low-income users, or those who come from more culturally conservative backgrounds [31,32,33]. These results highlight the importance of understanding both the behavioral and cultural aspects that contribute to differences in telemedicine adoption across different populations and settings. This broader perspective complements the theoretical contributions of TAM and UTAUT in informing the complex nature of technology acceptance in healthcare [30,35].

This review focuses on the uptake of telemedicine, as far as we know. By examining 221 research publications on the factors influencing usage intentions and their implications, researchers will gain a clearer understanding of the key elements and theories involved. This will contribute to the development of information systems and health behavior theories. The study also aids in categorizing the causes and effects related to telemedicine. Furthermore, analyzing the moderating effect of COVID-19 provides insights into what is most significant at various times. The analysis of cultural moderation also sheds light on the essential characteristics of different cultures. The structure of the study is as follows: Section 2 presents the hypotheses and reviewed literature, Section 3 outlines the research methodology, and Section 4 discusses the findings. Section 5 addresses the implications, while Section 6 concludes with the limitations and future research directions.

LITERATURE REVIEW

Factors influencing behavior such as attitude, subjective norm, perceived behavioral control, risk perception, and trust play a significant role in the adoption of telemedicine. An individual's attitude towards a behavior, such as adopting new

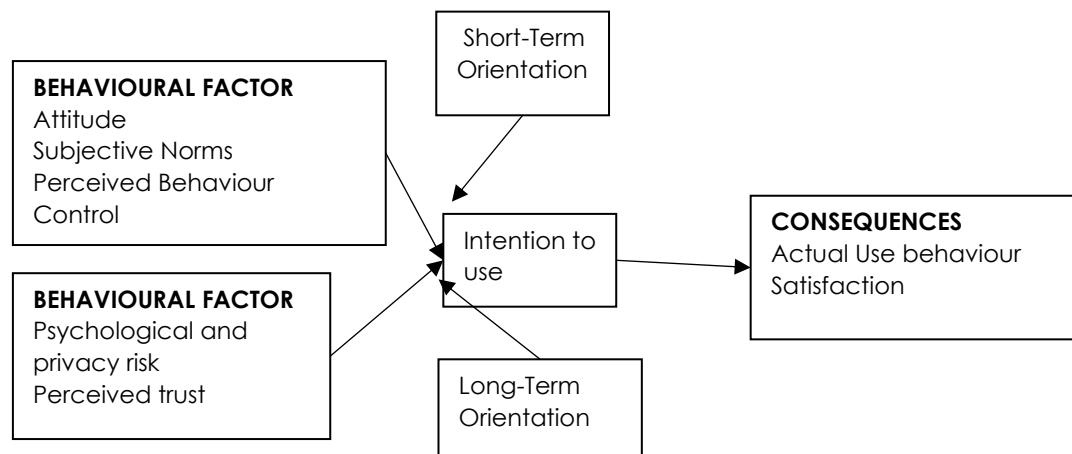
technology, can be either positive or negative. The Technology Acceptance Model (TAM) suggests that attitude is a predictor of technology usage [18]. This relationship has been validated in telemedicine and various other domains [12; 22]. A positive attitude towards telemedicine can lead to increased adoption, as users recognize its value and ease of use [10]. Subjective norm refers to the influence of family, friends, and colleagues on an individual's behavior [14]. The adoption of technology is often shaped by social expectations, as individuals tend to follow the lead of their peers [29]. When telemedicine becomes a norm within social circles, it fosters a sense of belonging. Observing peers utilizing a technology can boost self-efficacy and increase the likelihood of its adoption [5]. Given that most individuals lack medical expertise, they frequently depend on trusted sources within their networks to influence their perceptions and acceptance of telemedicine services. Perceived behavioral control (PBC) refers to an individual's belief in their ability to perform a behavior based on their resources and capabilities [29]. The Theory of Planned Behavior (TPB) posits that feeling in control over a behavior enhances the likelihood of engaging in it [21]. People who feel confident in managing their health online are more inclined to use telehealth services, making perceived behavioral control essential for telemedicine adoption. On the other hand, risk perception can impede technology adoption, particularly in online contexts where concerns about service performance, data privacy, and security arise. According to [20], risk refers to the potential for loss in the pursuit of the desired outcome of using an e-service. Recent studies indicate that risk is multifaceted, encompassing performance, financial, physical, social, and psychological aspects [19]. Trust is essential for online transactions, including the adoption of telemedicine [3]. The complexity of trust is illustrated through various types, such as knowledge-based trust, institutional trust (which includes structural assurances and situational standards), calculative trust, cognitive trust (the illusion of control), and personal truth [8]. Having credible medical professionals, secure digital environments, and effective communication can enhance consumer trust and encourage the adoption of telemedicine.

CONSEQUENCES

Telemedicine adoption influences how people use it and their overall satisfaction. Behavioral intention—essentially, a person's aim or desire to engage in a specific action—can predict actual usage [12]. In this context, behavioral intention refers to an individual's readiness to participate in medical teleconsultation. According to the Technology Acceptance Model (TAM), a person's intention to use a system plays a crucial role in its adoption [6]. [23] identified a connection between behavioral intention and the use of telemedicine technology among healthcare professionals. The success of online transactions, including telemedicine, relies heavily on trust [26]. The complexity of trust is illustrated through various forms, such as knowledge-based trust, institutional trust (which includes structural assurances and situational standards), calculative trust, cognitive trust (the illusion of control), and personal trust [8]. Having credible medical professionals, secure digital environments, and effective communication can enhance consumer trust and encourage the adoption of telemedicine. Another crucial aspect of telemedicine usage is user satisfaction. [4] found a significant correlation between customer satisfaction and the evaluation of products or services, which in turn affects ongoing usage. After a positive experience, users are more likely to return to telemedicine services. [27] emphasized that user satisfaction is a key driver of technology adoption and engagement. In the realm of mobile commerce (m-commerce), [11] discovered that satisfaction enhances users' commitment to continued use. In the context of healthcare technology, user satisfaction plays a vital role in the adoption of digital health services. According to [2] satisfaction with mobile health (m-Health) applications significantly boosts users' likelihood of utilizing them. A positive telemedicine experience—marked by ease of use, reliability, and perceived benefits—can enhance patient satisfaction and encourage further use.

CULTURAL ORIENTATION

[7] describe culture as the shared mental programming that sets one group apart from another. Cultural factors play a crucial role in shaping users' attitudes, ideas, and perceptions [15]. The cultural dimensions outlined by [9] have been used as a representation of culture. People with a short-term orientation tend to adhere to social norms while being cautious about societal changes. In contrast, long-term orientation (LTO) reflects how much individuals prioritize thrift and persistence in planning for the future [27]. Those with long-term orientations typically focus more on the future benefits they aim to achieve [16]. In this scenario, individuals may show increased sensitivity to risks, indicating that perceived risk could have a stronger impact on telemedicine adoption in cultures with a long-term orientation compared to those with a short-term orientation. The visual framework that integrates behavioral and cultural determinants is presented below:

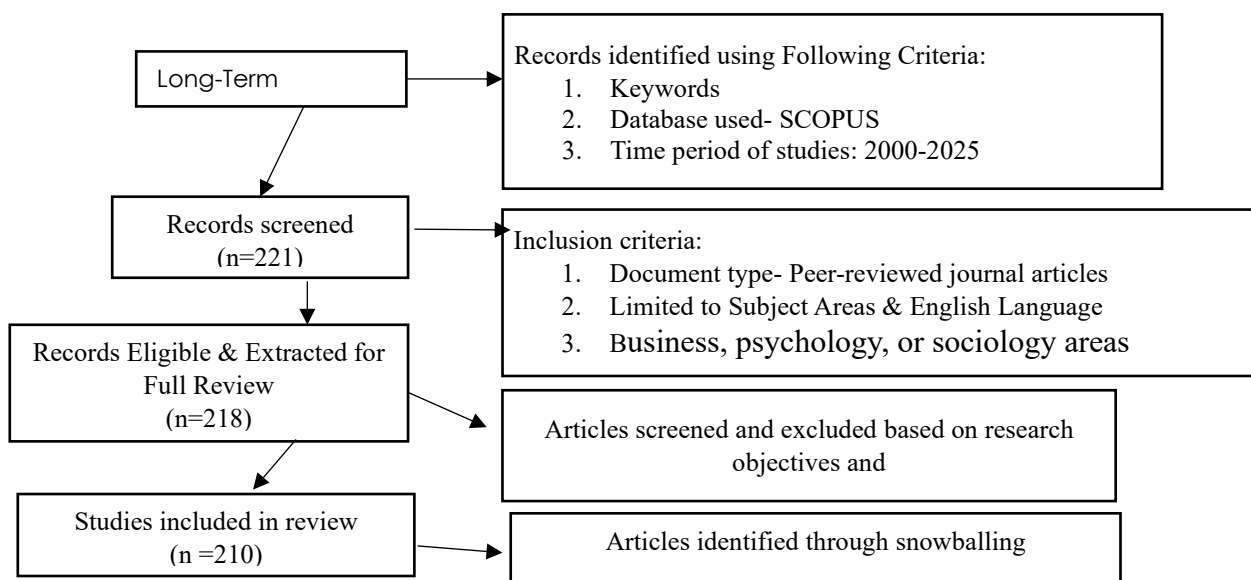


METHODOLOGY

RESEARCH DESIGN

This study follows a systematic literature review (SLR) approach to analyze existing research on the adoption behavior of telecare, telehomecare, telemedicine, telemonitoring, telehealth, physiologics, m-health, online doctors, and virtual doctors. The review is conducted to synthesize findings across business (BUSI), psychology (PSYC), and sociology (SOC) subject areas to understand the behavioral aspects influencing adoption.

To ensure a comprehensive review, we employed a structured search strategy using the Scopus database. The search query included key terms related to telehealth technologies (e.g., "telecare," "telehomecare," "telemedicine," "telemonitoring," "telehealth," "physiologics," "m-health," "online doctor," "virtual doctor") combined with adoption and behavior-related aspects ("adoption," "behavior"). To refine the selection of relevant studies, we applied specific inclusion and exclusion criteria. The inclusion criteria encompassed peer-reviewed journal articles and conference papers published in English, with a focus on the behavioral aspects of telehealth adoption. Additionally, only studies addressing telehealth adoption within the domains of business, psychology, or sociology were included. On the other hand, studies that solely concentrated on technical development without behavioral insights, articles outside the selected subject areas (such as medicine, engineering, or computer science), and non-peer-reviewed publications like editorials, commentaries, and book chapters were excluded. Furthermore, duplicate studies or those lacking sufficient methodological details were also omitted from the final selection. This search resulted in 221 articles that were considered for further analysis. The Search Query as follows: ("telemedicine" OR "telehealth" OR "virtual doctor" OR "teleconsultation" OR "m-health") AND ("adoption" OR "acceptance" OR "behavior" OR "intention"). The PRISMA and coding table is also presented below.



Authors	Title	Year	First-order Codes	Second-order Codes	Final Theme
Chandrasekaran B.; Kundapur P.P.; Rao C.R.	Are free workplace health promotion apps adequately designed to support behavior change?	2021	Health behavior change, App usage evaluation	Behavioral determinants	Behavioral Determinants of Health Tech Adoption
Md Fadzil N.H.; Shahar S.; Singh D.K.A.; Rajikan R.	Mapping the landscape of health tech for cognitive aging	2024	Cognitive decline, Elderly users, Digital tools	Age-specific adoption barriers	Technology Use in Aging Population
Voss M.; Geniets A.; Winters N.	Strategies for Digital Clinical Teaching During COVID-19	2024	Digital health training, Tech integration	Digital literacy as enabler	General Digital Health Strategies
Duncan A.; Liddle M.; Stark L.J.	Development of Daily Living Skills App for Autism	2021	Autism, Adolescents, Skill support app	Inclusive digital health design	Behavioral Determinants of Health Tech Adoption
Huang W.; Lee G.T.; Zhang X.	Dealing with uncertainty in behavior services for ASD	2023	Psychological behavior, Uncertainty, ASD	Behavioral determinants	Behavioral Determinants of Health Tech Adoption

DISCUSSION

This systematic literature review offers a comprehensive overview of the current research on the behavioral factors that affect the adoption of virtual doctor consultations, while also examining how cross-cultural factors may moderate these relationships. The study looks into the cognitive, emotional, and social influences on the acceptance of virtual healthcare services by drawing on established behavioral theories, such as the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT). It highlights not only well-known determinants like performance expectancy, effort expectancy, and facilitating conditions but also new behavioral factors—such as trust, perceived risk, contamination avoidance, and perceived severity of illness—that play a significant role in telemedicine adoption.

The review emphasizes the crucial role of credibility factors, particularly trust and perceived risk, in shaping how users view virtual doctor consultations. Concerns about privacy and psychological risks often impede adoption, underscoring the need for healthcare providers and platform developers to implement robust data security measures and effective communication strategies. Furthermore, social influence and subjective norms play a significant role, especially in collectivist cultures where healthcare choices are often influenced by family and community expectations. The findings reveal that users' perceptions of telemedicine services vary across different cultural contexts, with elements such as uncertainty avoidance, power distance, and masculinity-femininity significantly affecting adoption behaviors. Use of these emerging trends in digital healthcare including AI integration, wearable technology and chatbot-based telemedicine is swiftly impacting the digital healthcare industry and user adoption behaviour. While Artificial Intelligence (AI) improves diagnostic accuracy, automates triage, and makes case management recommendations, it also introduces new challenges for transparency, accountability, and trust. Wearable devices like smartwatch and fitness tracker allow real time health monitoring with patients while providing real time data that provides high perceived behavioral control and increase engagement. Likewise, the growing application of chatbots and virtual assistants to help with appointment scheduling, medication reminders, and initial symptom assessment is enhancing access to care while relieving some burden on the healthcare system. Although these technologies may provide convenience and

personalization, they evolve additional dimensions of perceived risk, data privacy, and technological trust which require consideration in both design and regulation to enable wide-scale adoption of telemedicine. The results from the systematic literature review (SLR) provide six underpinning thematic domains that affect telemedicine adoption for telemedicine: behavioural determinants, trust and privacy, digital health adoption, systemic readiness, socio-demographics and equitable digital healthcare solution. Using the Gioia method of thematic coding, first-order concepts (e.g., health behavior change, risk perception, perceived usefulness, and digital literacy) are categorized into second-order themes (and higher) (e.g., behavioral intention, institutional trust, and access barriers due to age). They, in turn, aggregate into higher-order dimensions that disentangle types of one-to-one user behaviour in digital healthcare settings. The analysis reveals that cultural values and novel digital trends, including AI-based diagnostics, wearable technologies, and chat-based interfaces, are changing familiar technology adoption behaviors such as trust, malevolence, ease of use, and self-efficacy surrounding telemedicine. This analysis shows that regarding technology supported behavioral constructs such as trust, ease of use and self-efficacy remain at the center of telemedicine adoption, there are significant changes over time as cultural values and new digital trends are reshaping user reception processes. This SLR indicates that mere technical efficiency of a digital health strategy is not sufficient, and socio-cultural sensitivities and user psychology and trust in the technology used must be taken into account. This entails creating platforms that are culturally adaptive, trustworthy and accessible to two key stakeholders, policymakers and developers, as technological advancement continues to grow within healthcare ecosystems globally, and users with different normative values face such platforms from different regions and age groups. The study provides multiple practical and theoretical implications for relevant stakeholders aligned with the digital healthcare ecosystem. The results emphasize the importance of user trust, cultural compatibility, and tailored support for telemedicine platforms, particularly in countries with low digital literacy or high levels of uncertainty avoidance. To be able to design interventions that would increase the user engagement based on the behavioral determinants identified, health care providers can tailor design such as elderly user-friendly interfaces or integrate culturally specific communication behavioral. The study highlights the need for developing regulatory systems that protect data privacy and provide algorithmic transparency, which are critical for building trust in institutions, for policymakers. In theory, the integrated framework proposed here connects behavioral approaches (for example, TAM, TPB) and cultural dimensions (for example, Hofstede'), enabling a more holistic view of telemedicine adoption over a wide range of countries and cultures.

These insights allow telemedicine providers to tailor their services to meet user expectations in different cultural and demographic contexts. By understanding the importance of behavioral factors such as perceived ease of use, performance expectancy, and effort expectancy, platform developers can create user-friendly interfaces and incorporate interactive features that boost engagement.

THEORETICAL IMPLICATIONS

Theoretical relevance of the review is that it contributes to the existing body of knowledge on the adoption of digital health and telemedicine by encompassing the behavioural technology acceptance models, socio-cultural model, and new perspectives on technology in the field. It once again confirms the pivotal role of the key TAM- and UTAUT-related variables, such as perceived usefulness, perceived ease of use, expectancy of effort, and facilitating conditions, but it also shows that these variables cannot be discussed outside of the context of the larger cultural and psychological ecosystem within which telemedicine is adopted. To follow the new administrations of TAM/UTAUT extension, the combined framework that has been created below shows the need to integrate psychosocial inhibitions, emotional reactions, perceptions of credibility, and organisational preparedness into technology-acceptance models in healthcare environments. The review also makes a theoretical contribution to the explicit connection of the behavioural constructs to the cultural framework like Hofstede dimensions (individualism collectivism, uncertainty avoidance, power distance, masculinity femininity) hence explaining how cultural values affect social influence, trust formation, perceived risk and perceived behavioural control in cross-nation settings. The review offers a dose of complexity to the emerging literature on the moderating effect of cultural values in mHealth and health-service innovation adoption by mapping culturally specific differences in adoption patterns. The second theoretical contribution is the reconstruction of trust and risk in the field of digital healthcare. Instead of considering the concept of trust to be unidimensional, as shown in the review, trust towards telemedicine is a multi-domain concept because it engages with various perceived risks, including a loss of

privacy, misdiagnosis, psychological discomfort or perceived evilness of robotic models. This multi-domain approach builds upon the new findings of trust measurement in digital health, by bringing into sight new and poorly studied constructs, such as contamination avoidance and perceived malevolent purpose of digital systems, as subsequent influences of adoption behaviour. In addition, the review includes the introduction of new trends in technology like AI-based diagnostics, dialog agents, and wearable bioelectronics to expand the traditional telemedicine paradigm that traditionally concentrated on video sessions. These emerging technologies present different behavioural processes, including algorithmic opacities, apparent fairness and machine-human complementary, that the review recommends as necessary extensions to the theoretical models of telemedicine adoption in the future. Lastly, the review supports theorising in favour of equity by showing how socio-demographic factors (age, digital literacy, income, education, rural-urban gaps) interact with cultural norms to produce stratified inequalities of telemedicine adoption. The results suggest that the traditional average user models are ineffective in explaining real-world adoption patterns and future models must include intersectional and life-course approaches in order to describe the difference in abilities, resources and cultural orientations. When taken together, the theoretical contributions made herein make the proposed integrated framework a transition between behavioural acceptance theory, cultural studies and new technological paradigms, to provide a more holistic and in-depth view of how people in different settings embrace and use virtual healthcare systems.

MANAGERIAL IMPLICATIONS

As a managerial and policy perspective, the review provides feasible information to telemedicine providers, platform developers, healthcare organisations and regulators who want to improve the user acceptance and engagement. One of the key implications is that there is an imminent necessity to design telemedicine platforms that anticipate trust, transparency and privacy in that they are always found to be main predictors of adoption. Perceived risk can be mitigated by clear communication of the encryption protocols, information practices and institutional accountability, although aspects of interfaces like explanation panels (why this recommendation?), AI confidence indicators or easy-to-understand privacy dashboard can lessen algorithmic obscurity and enhance perceived trustworthiness. The need to design platforms in a culturally adaptive manner is also emphasized in the review. The high uncertainty-avoidance or high power-distance culture will favor formal workflow, visible physician involvement, and formal communication, and the collectivist culture might be favored with the functions that provide the opportunity to involve families or caregivers. This highlights the importance of localisation strategies and not general roll-outs on the platform. The other implication relates to the existence of the digital divide: older adults, less educated people and rural residents need more specific support, which can be provided by simplified navigation with assisted onboarding through community health workers or helplines and integrating digital health literacy into communal health programs. The review also emphasizes the management significance of acting responsibly when deploying AI, chatbot and wearable technologies. By placing such tools as aids, not as substitutes, i.e., automated systems conduct general triage or reminders and refer more complex cases to human clinicians, this can be made more efficient without compromising relational trust. The managers should also develop effective procedures of escalation, human in the loop review and open communication of AI constraints. On the policy level, institutional and regulatory trust should be enhanced. Regulators ought to implement stringent data protection, require documenting of Algorithms transparency and availing systems of grievance redressal. Educating the public through communication campaigns explaining the protection of regulations in very simple language can also help to increase trust. In addition, behaviour-based intervention design can also provide avenues of enhancing the engagement: improving perceived usefulness with the help of effective communication of clinical benefits, reinforcing self-efficacy with the help of guided tutorials or live support, and eliminating contamination-related concerns with the help of transparent infection-control messaging in hybrid care structures. Lastly, it is the organisational preparedness to the implementation. Medical workers should be trained not only in technologies of telemedicine but also in effective interaction with patients in the Internet space. Incentives, workflows and quality measures need to be aligned with hybrid and digitally mediated care through internal policies, therefore, making telemedicine a fundamental part of the service delivery and not a peripheral one. Collectively, these managerial implications give a holistic roadmap on how to develop culturally inclusive, trustworthy and user-friendly telemedicine ecosystems that can empower diverse people in an ever-digitized healthcare environment.

LIMITATIONS

This systematic review, while thorough, has some significant limitations. It relies on published literature, which may overlook new or unpublished studies about the adoption of virtual doctor consultations. The behavioral factors analyzed are limited to those that have been extensively researched before, potentially missing out on new psychological or technological influences on adoption. Future studies should focus on longitudinal research to better understand how behavioral determinants change over time, particularly in the context of global health crises and technological progress.

While this systematic literature review covers a wide range of topics, it does have limitations. Consideration: The review is limited to peer-reviewed articles published in English and indexed in Scopus, potentially missing relevant literature from nonindexed or regional journals. Second, although the study finds important behavioral and culture-related domains, it does not provide a meta-analysis or other form of quantitative synthesis due to the considerable heterogeneity of methodologies and measures across studies. Third, the review does not delve into demographic subgroup analyses (e.g., adoption behaviour by gender, income or health status), that may provide additional layered understanding. Finally, speculative suggestions regarding the emerging use of technology such as AI and chatbots are made, but no empirical analysis is applied to them — an area this paper considers will need to be addressed in future through primary research and testing of digital interventions in real-world contexts.

CONCLUSION

This systematic literature review provides an in-depth analysis of the behavioral factors that influence the adoption of virtual doctor consultations, highlighting the role of cross-cultural elements. The findings reveal that technology acceptance, behavioral aspects, and credibility play a crucial role in user adoption decisions, with cultural differences significantly impacting these dynamics. This review integrates theoretical insights and empirical evidence to deepen the understanding of telemedicine adoption, offering valuable implications for researchers, healthcare providers, and policymakers who seek to enhance the accessibility and effectiveness of virtual healthcare services in diverse global settings.

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TELE-MEDICINE EFFECT ON PSYCHIATRIC PATIENT'S EXPERIENCE IN A UAE OUTPATIENT DEPARTMENT

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ABSTRACT

BACKGROUND:

Mental health disorders affect approximately one in eight individuals globally, with anxiety and depression prevailing. Tele-mental health (TMH), including telepsychiatry, telepsychology, and tele behavioral health, has emerged as a promising solution to accessibility issues and stigma, especially post-COVID-19.

OBJECTIVES:

This study aims to explore the impact of Tele-medicine on psychiatric patients' experiences in outpatient settings, focusing on satisfaction, perceived stigma, compliance, and service preferences.

METHODS:

A comparative cross-sectional design enrolled 232 psychiatric patients from the Dhafra Family Medicine Center, Abu Dhabi, between June and July 2023. Participants were randomly assigned to Tele-medicine (n=122) or in-person consultations (n=110). Data were collected using a Telepsychiatry Services Survey and analyzed using SPSS.

RESULTS:

This research examines the influence of telemedicine on the experiences of psychiatric patients, showcasing notable disparities between groups. Specifically, individuals engaged in tele-mental health services demonstrated significantly elevated satisfaction levels ($M=68.22\pm11.16$) compared to those attending in-person consultations ($M=58.68\pm14.22$), alongside notably reduced perceptions of stigma ($M=7.56\pm2.10$ vs. $M=10.35\pm1.77$) and stronger preferences for services ($M=13.52\pm1.32$ vs. $M=12.12\pm2.28$), all with $p<0.001$.

CONCLUSION:

Tele-medicine significantly enhances psychiatric outpatient care experiences, addressing barriers like stigma and accessibility, and improving satisfaction and compliance.

KEYWORDS

mental health, telemedicine, outpatient care, patient satisfaction, stigma, patient compliance, preferences, psychiatric patients, comparative cross-sectional design, community health

INTRODUCTION

Mental health disorders, defined as a significant impairment in an individual's intellect, emotional control, or behavior, often resulting in distress, functional disability, or self-harm risk [1]. The prevalence of mental health issues globally is staggering, affecting approximately one in eight individuals, or 970 million people worldwide [2]. Among these conditions, anxiety and depressive disorders prevail.

Despite numerous prevention and treatment strategies, many individuals with mental health conditions encounter barriers in accessing services. Stigmatization, discriminatory practices, and human rights violations pose significant obstacles to receiving proper care [1], leading to social exclusion and hindering treatment [3]. These challenges encompass emotional, cognitive, and behavioral aspects, addressed through pharmaceutical and psychosocial support [4].

A systematic review spanning 2005 to 2015 identified various factors contributing to medication non-adherence among individuals with mental health conditions [5]. Tele-medicine or Telehealth, as defined by the Health Resources and Services Administration [6], emerges as a promising solution to bridge the accessibility gap in mental healthcare. Its application to severe mental illnesses has shown viability, acceptability, and effectiveness comparable to in-person care [7], potentially reducing healthcare costs and enhancing resource accessibility [8].

Tele mental health (TMH) refers to the use of Telehealth in mental healthcare, which encompasses telepsychiatry, telepsychology, and tele behavioral health [9]. Applications of current TMH include provider collaboration, education, treatment, monitoring, and mental health assessment [10]. It can be provided by various professionals, including psychologists, psychiatrists, nurse practitioners, counselors, and social workers [10]. TMH has been demonstrated to help address geographic obstacles to mental health treatments by extending the reach of the current mental health providers. The evolution of (TMH) encompasses various modalities, including individual therapy, psychopharmacologic treatment, and mobile applications, addressing a spectrum of mental health issues [11]. Numerous studies have demonstrated its effectiveness across diverse conditions [12-19], further highlighted by the COVID-19 pandemic's risks to traditional consultations [11].

Psychiatric patients encounter multifaceted challenges including stigma, limited accessibility, and treatment compliance variations. Telemedicine offers promise in addressing these barriers, yet its correlation with various factors remains inadequately explored [20]. Understanding its impact on patient satisfaction, stigma, service preferences, and compliance in outpatient department (OPD) settings is crucial.

This research aims to fill the gap in understanding telemedicine's effects on psychiatric patient experiences, particularly in the UAE. By exploring satisfaction, stigma, service preferences, and compliance, it can shape telemedicine practices, improve mental healthcare delivery, reduce stigma, and enhance patient satisfaction.

This study investigates telemedicine efficacy in psychiatric follow-up appointments in OPD settings, assessing satisfaction, stigma, service preferences, and compliance. It aims to discern significant differences in these factors among patients with varying socio-demographic characteristics. The study objectives include examining differences between telemedicine and in-person visits on satisfaction, stigma, service preferences, and compliance.

METHODS

STUDY DESIGN AND SAMPLE

This comparative cross-sectional study aimed to assess the effectiveness of Tele-medicine visits for psychiatric patients in outpatient departments (OPD). The study was conducted at the psychiatry clinic within the Dhafr Family Medicine Center (DFMC) outpatient department, located in Al Dhafra Region, Madinat Zayed, Abu Dhabi, United Arab Emirates. The target population comprised all psychiatry clinic patients, with the accessible population consisting of DFMC psychiatry clinic patients or their caregivers who visited it during the data collection period from June to July 2023.

POPULATION AND SAMPLING STRATEGY

Convenience sampling was utilized to recruit participants, with inclusion criteria encompassing patients over 18 years who visited the psychiatry clinic, proficiency in Arabic or English, and the ability to understand survey questions. Exclusion criteria included first-time visitors and individuals with cognitive impairments or language barriers hindering questionnaire comprehension. The sample size was determined using the formula: $n = [z^2 * p * (1 - p)] / e^2$, with adjustments made for potential data issues, resulting in a final sample size of 240 patients.

DATA COLLECTION TOOLS

The primary data collection instrument utilized in this study was the Client Satisfaction and Experience Survey for Telepsychiatry Services. Bilingual survey (Arabic and English language). This survey was meticulously crafted to comprehensively assess patients' perceptions and experiences regarding telemedicine visits for psychiatric follow-up appointments. Adapted from established tools developed by (21-23), the questionnaire underwent rigorous validation processes to ensure its reliability and validity. The survey consisted of 32 questions categorized into four domains:

1. **Socio-demographic Variables:** This domain encompassed seven questions aimed at capturing essential demographic information, including age, gender, education level, employment status, and marital status.
2. **Patient Satisfaction:** The second domain included 18 questions designed to gauge patients' satisfaction levels with telemedicine visits. These questions were measured on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." Patients were asked to provide feedback on various aspects of their telemedicine experience, such as the quality of communication with healthcare providers, the convenience of scheduling appointments, and overall satisfaction with the service received. Total satisfaction scores were calculated based on the sum of responses to the 18 satisfaction-related questions. Scores were categorized into two levels: low satisfaction (score < 50th percentile) and high satisfaction (score > 50th percentile).
3. **Stigma Levels:** The third domain comprised three questions intended to assess patients' perceptions of stigma associated with receiving psychiatric care through telemedicine. Like the patient satisfaction domain, these questions were measured on a 5-point Likert scale, with responses ranging from "strongly disagree" to "strongly agree". Total stigma levels were determined by summing responses to the three stigma-related questions. Similar to satisfaction scores, stigma levels were categorized into low stigma (score < 50th percentile) and high stigma (score > 50th percentile).
4. **Service Preferences:** The fourth domain included four questions aimed at exploring patients' preferences regarding the mode of healthcare delivery for psychiatric follow-up appointments. Patients were asked to indicate their level of agreement with statements related to their preference for telemedicine visits versus in-person appointments, as well as factors influencing their choice. Total service preference scores were calculated by summing responses to the four service-related questions. Scores were categorized into two levels: low preference (score < 50th percentile) and high preference (score > 50th percentile).

Prior to full-scale data collection, a pilot study was conducted to evaluate the feasibility, usability, and readability of the survey instrument. Overall, the Client Satisfaction and Experience Survey for Telepsychiatry Services served as a robust tool for gathering comprehensive data on patients' perspectives and preferences regarding telemedicine visits for psychiatric follow-up appointments. Through meticulous development, validation, and refinement processes, the survey instrument provided valuable insights into the effectiveness and acceptability of telemedicine services in the psychiatric care setting.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Institutional Review Board (IRB) at Al al Bayt University and the Al Dhafra Hospital. Informed consent was obtained from all participants, ensuring comprehension of study objectives, voluntary participation, and confidentiality maintenance. Measures were implemented to mitigate participant discomfort or anxiety.

DATA COLLECTION PROCEDURE

After obtaining ethical approval, the principal investigator initiated contact with the director of the Dhafra Family Medicine Center (DFMC) outpatient department to facilitate access to potential participants and obtain permission to conduct the study on-site. A meeting was arranged to discuss the study's purpose, procedures, and ethical considerations with relevant stakeholders.

Psychiatry clinic patients scheduled for follow-up appointments at the DFMC outpatient department were identified as potential study participants. Eligibility criteria, including age, language proficiency (Arabic, English), and appointment type (Tele-medicine or in-person), were applied to screen patients. Those meeting the inclusion criteria were invited to participate in the study.

Prior to data collection, participants were provided with detailed information about the study objectives, procedures, potential risks, and benefits. Informed consent was obtained from willing participants, either through written consent forms for in-person participants or via digital consent forms for Tele-medicine participants, which were sent through messaging platforms such as WhatsApp.

Participants who provided consent were administered the Client Satisfaction and Experience Survey for Telepsychiatry Services. For Tele-medicine participants, the survey was delivered electronically, allowing them to complete it remotely at their convenience. In-person participants received hard copy surveys and were guided through the questionnaire by trained research personnel.

Data collection sessions were conducted during weekdays from Monday to Friday over a specified period (June to July 2023) to accommodate the availability of participants. To minimize bias, data collection sessions were scheduled at various times throughout the day to capture a diverse range of patients.

Participants were assured of the confidentiality and anonymity of their responses. Each participant was assigned a unique identification number to anonymize their data. Measures were taken to ensure that participants completed the survey in a private setting to maintain confidentiality.

Throughout the data collection process, quality assurance measures were implemented to ensure the integrity and validity of the data. Research personnel were trained to administer the survey consistently and address any participant queries or concerns. Additionally, periodic checks were conducted to verify the accuracy and completeness of the collected data.

Completed surveys were collected, coded, and entered into a secure electronic database for storage and analysis. Strict data security protocols were followed to protect participants' confidentiality and comply with data protection regulations. Access to the dataset was restricted to authorized research personnel only. Continuous monitoring and follow-up were conducted to track participant responses, address any issues or discrepancies, and ensure adherence to ethical guidelines throughout the study period. Any concerns raised by participants were promptly addressed to maintain trust and compliance.

By adhering to a systematic and ethical data collection procedure, the study was able to gather comprehensive and reliable data on patients' experiences and preferences regarding Tele-medicine visits for psychiatric follow-up appointments. This rigorous approach ensured the validity and integrity of the study findings, contributing valuable insights to the field of telepsychiatry and healthcare delivery.

STATISTICAL ANALYSES

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 28. Initially, descriptive statistics provided a snapshot of participant demographics and key variables. Then, inferential tests like t-tests and ANOVA were used to compare outcomes between Tele-medicine and in-person attendance groups, examining factors like satisfaction, stigma perception, and service preferences. Correlation analyses explored relationships between variables, while regression analysis investigated how demographic factors influenced outcomes. Rigorous checks ensured the validity of findings, with significance set at 0.05. Overall, the analysis shed light on Tele-medicine's role in psychiatric care.

RESULTS

SOCIODEMOGRAPHIC CHARACTERISTICS

A total of 232 psychiatric patients participated in the study. Among them, 52.6% (n=122) engaged through telemedicine, while 47.4% (n=110) attended in-person psychiatric clinics. Most participants were female (56.9%, n=132), predominantly from Madinat Zayed (74.1%, n=172). The age distribution varied, with the highest proportion (38.8%, n=90) falling in the 31-43 years age group. Most participants were married (61.2%, n=142), had a secondary education level or lower (44.4%, n=103), and were employed (58.2%, n=135), with a monthly income exceeding 21,000 AED* (39.7%, n=92) (Table 1).

TABLE 1: PSYCHIATRIC PATIENTS' SOCIO-DEMOGRAPHICAL CHARACTERISTICS N=232

Variable	Category	N (%)
Groups	Tele-medicine	122 (52.6%)
	In-person clinic	110 (47.4%)
Gender	Female	132 (56.9%)
	Male	100 (43.1%)
Address	Madinat Zayed	172 (74.1%)
	Other towns	60 (25.9%)
Age groups	18-30years	76 (32.8%)
	31-43years	90 (38.8%)
	44-56years	39 (16.8%)
	>57years	27 (11.6%)
Marital status	Single	60 (25.9%)
	Married	142 (61.2%)
	Others (divorce/widow)	30 (12.9%)
Education level	Primary	34 (14.7%)
	Secondary	69 (29.7%)
	College/university	109 (47.0%)
	Postgraduate	20 (8.6%)
Occupation	Not working	97 (41.8%)
	Working	135 (58.2%)
Monthly income	10.000 AED or less	78(33.6%)
	11.000-20.000 AED	62 (26.7%)
	21.000 AED or more	92 (39.7%)

* 1 AED = 0.2723 USD, 1,000 AED equals approximately 272.29 USD

Based on the latest reports, the **average national income in the UAE** varies by emirate and profession. Here are the key figures:

- **Dubai:** 15,700 AED/month → approx. **190,000 AED/year**
- **Abu Dhabi:** 14,900 AED/month → approx. **178,800 AED/year**
- **Sharjah:** 12,800 AED/month → approx. **153,600 AED/year**
- **Northern Emirates:** 11,200 AED/month → approx. **134,400 AED/year** [30].

Across all sectors, the **average monthly salary in the UAE** typically ranges between **12,000 to 20,000 AED**, depending on industry, experience, and location [31].

N: frequency

?: percentages

PATIENT SATISFACTION

Independent T-tests were performed to assess differences in satisfaction levels between telemedicine and in-person psychiatric appointments (Table 2). Telemedicine participants reported significantly higher satisfaction in several domains: ease of appointment booking ($p = 0.006$), clarity of communication with psychiatrists ($p = 0.002$), and overall experience ($p = 0.011$). However, satisfaction with waiting times did not differ significantly between the two groups ($p = 0.056$).

TABLE 2: MEAN DIFFERENCE OF SATISFACTION SCORE BASED ON PSYCHIATRIC PATIENTS' GROUPS (IN-PERSON, N=110) AND (TELE-MEDICINE, N=122)

No	Test	Item description	Groups	Mean $\pm$ SD	p-value
1	Independent T-test	It was easy to book my in-person psychiatry appointment	In-person	3.39 $\pm$.99	0.006
		It was easy to book my Tele psychiatry appointment.	Tele-medicine	3.75 $\pm$.97	
2	Independent T-test	During my in-person psychiatry appointment, I was able to see the psychiatrist clearly.	In-person	2.94 $\pm$ 1.32	<0.001
		During my Tele psychiatry appointment, I was able to see the psychiatrist clearly.	Tele-medicine	3.64 $\pm$.98	
3	Independent T-test	During my in-person psychiatry appointment, I was able to hear the psychiatrist clearly	In-person	3.52 $\pm$ 1.10	<0.001
		During my Tele psychiatry appointment, I was able to hear the psychiatrist clearly.	Tele-medicine	4.01 $\pm$.76	
4	Independent T-test	I am confident that the psychiatrist and my health care providers are working as a team.	In-person	3.31 $\pm$ 1.12	<0.001
		I am confident that the psychiatrist and my health care providers are working as a team.	Tele-medicine	3.79 $\pm$.87	

5	Independent T-test	I feel that there was an adequate amount of time allotted for the in-person psychiatry appointment.	In-person	3.12±1.40	<0.001
		I feel that there was an adequate amount of time allotted for the Tele psychiatry appointment.	Tele-medicine	3.76±.99	
6	Independent T-test	I believe Tele psychiatry visit is just as effective as an in-person psychiatry appointment.	In-person	3.10±1.41	<0.001
		I believe Tele psychiatry is just as effective as an in-person psychiatry appointment.	Tele-medicine	3.83±1.00	
7	Independent T-test	I was able to get an in-person appointment through psychiatry sooner than a tele psychiatry appointment	In-person	3.10±1.26	<0.001
		I was able to get an appointment through Tele psychiatry sooner than an in-person psychiatry appointment.	Tele-medicine	3.70±.92	
8	Independent T-test	I felt that confidentiality was protected throughout my in-person psychiatry appointment.	In-person	3.55±1.07	<0.001
		I felt that confidentiality was protected throughout my Tele psychiatry appointment.	Tele-medicine	4.00±.78	
9	Independent T-test	The psychiatrist understood my concerns.	In-person	3.61±1.05	0.002
		The psychiatrist understood my concerns	Tele-medicine	3.98±.73	

10	Independent T-test	The psychiatrist treated me with courtesy and respect	In-person	3.73±.91	<0.001
		The psychiatrist treated me with courtesy and respect.	Tele-medicine	4.14±.67	
11	Independent T-test	The psychiatrist explained my diagnosis in a way that I could understand.	In-person	3.62±1.10	<0.001
		The psychiatrist explained my diagnosis in a way that I could understand.	Tele-medicine	4.06±.71	
12	Independent T-test	The psychiatrist involved me in decisions about my treatment plan.	In-person	3.18±1.36	<0.001
		The psychiatrist involved me in decisions about my treatment plan.	Tele-medicine	3.90±.91	
13	Independent T-test	The psychiatrist explained the benefits and risks of any medications he/she recommended.	In-person	3.35±1.22	<0.001
		The psychiatrist explained the benefits and risks of any medications he/she recommended.	Tele-medicine	3.90±.80	
14	Independent T-test	I am confident that I will be able to follow the psychiatrist's recommendations.	In-person	3.20±1.37	0.004
		I am confident that I will be able to follow the psychiatrist's recommendations.	Tele-medicine	3.65±.97	
15	Independent T-test	I understand what to do if I have a mental health emergency following this appointment.	In-person	3.02±1.43	0.003
		I understand what to do if I have a mental health emergency	Tele-medicine	3.51±1.05	

		following this appointment.			
16	Independent T-test	I experienced a significant improvement in my mental health while I was waiting for my in-person psychiatry appointment.	In-person	3.51±1.12	0.027
		I experienced a significant improvement in my mental health while I was waiting for my Tele psychiatry appointment.	Tele-medicine	3.80±.82	
17*	Independent T-test	I experienced a significant decline in my mental health while I was waiting for my in-person psychiatry appointment.	In-person	2.01±1.41	<0.001
		I experienced a significant decline in my mental health while I was waiting for my Tele psychiatry appointment.	Tele-medicine	3.06±1.26	
18	Independent T-test	Overall, I am satisfied with the psychiatry appointment.	In-person	3.49±1.33	<0.001
		Overall, I am satisfied with the Tele psychiatry appointment.	Tele-medicine	3.84±1.07	
	Independent T-test	Total satisfaction mean score	In-person	58.68±14.22	0.030
			Tele-medicine	68.22±11.16	<0.001

STIGMA PERCEPTION

Stigma scores were significantly lower in the telemedicine group across all measured items: discomfort discussing emotions, feelings of embarrassment or shame, and concerns about others discovering their treatment ($p < 0.001$). The mean stigma score for telemedicine participants was notably lower ($M = 7.56$, $SD = 2.10$) compared to the in-person group ($M = 10.35$, $SD = 1.77$), with a large effect size ($d = 1.434$, 95% CI [1.144, 1.722]). These findings suggest that telemedicine substantially reduces perceived stigma associated with mental health care.

TABLE 3: MEAN DIFFERENCE OF STIGMA SCORE BASED ON PSYCHIATRIC PATIENTS' GROUPS (IN-PERSON, N=110) AND (TELE-MEDICINE, N=122)

No	Test	Item description	Groups	Mean $\pm$ SD	p-value
1	independent t-test	Dislike of talking about my feelings, emotions or thoughts.	In-person	3.69 $\pm$ 0.71	<0.001
			Tele-medicine	2.55 $\pm$ 0.88	
2	independent t-test	Feeling embarrassed or ashamed.	In-person	3.45 $\pm$ 0.93	<0.001
			Tele-medicine	2.55 $\pm$ 0.95	
3	independent t-test	Concerned that people I know might find out.	In-person	3.20 $\pm$ 1.07	<0.001
			Tele-medicine	2.46 $\pm$ 1.01	
	independent t-test	Total stigma mean score	In-person	10.35 $\pm$ 1.77	<0.001
			Tele-medicine	7.56 $\pm$ 2.10	

SERVICE PREFERENCE ANALYSIS

Analysis of service preferences, assessed via a 5-point Likert scale across four items, revealed a significant inclination toward telemedicine. Independent t-tests showed higher scores in the telemedicine group for convenience, comfort with video transmission, reduced concerns about internet confidentiality, and lower preference for in-person visits. The overall mean preference score was significantly greater in the telemedicine group ($M = 13.52$, $SD = 1.32$) than in the in-person group ($M = 12.12$, $SD = 2.28$), with $p < 0.001$. The effect size was medium (Cohen's $d = 0.753$, 95% CI [0.486, 1.018]), indicating a substantive difference in service preference between modalities.

TABLE 4: MEAN DIFFERENCE OF SERVICE PREFERENCES SCORE BASED ON PSYCHIATRIC PATIENTS' GROUPS (IN-PERSON, N=110) AND (TELE-MEDICINE, N=122)

No	Test	Item description	Groups	Mean $\pm$ SD	p-value
1	independent t-test	Tele-medicine visits are more convenient (save time, save money, suitable for my health/mental health condition)	In-person	2.69 $\pm$ 0.96	<0.001
			Tele-medicine	3.53 $\pm$ 0.91	
2*	independent t-test	Lack of comfort with the technology or video visit	In-person	3.05 $\pm$ 0.98	<0.001
			Tele-medicine	3.61 $\pm$ 0.80	
3*	independent t-test	Concerns about confidentiality over internet connection	In-person	2.94 $\pm$ 0.97	<0.001
			Tele-medicine	3.74 $\pm$ 0.69	
4	independent t-test	I prefer in-person psychiatry clinic appointments.	In-person	3.45 $\pm$ 0.80	<0.001
			Tele-medicine	2.65 $\pm$ 0.87	

Total service preferences mean score	In-person	12.12±2.28	<0.001
	Tele-medicine	13.52±1.32	

* Reversed items

COMPLIANCE RATE

Compliance rates were significantly higher among telemedicine patients compared to those attending in-person psychiatric clinics, as shown in Table 5. In June, telemedicine attendees had a compliance rate of 75.9% versus 58.06% for in-person patients, with a small effect size ($h = 0.38$). Similarly, in July, compliance was 80.0% for the telemedicine group compared to 60.71% for the in-person group ($h = 0.43$). These findings highlight the effectiveness of telemedicine in enhancing patient adherence to scheduled appointments.

TABLE 5: PROPORTION DIFFERENCE IN PATIENTS' COMPLIANCE BASED ON PSYCHIATRIC PATIENTS' GROUPS.

In-person	Check-in	No show	Total/real	Tele/check-in	No show	Total/tele	Z value	p-value
June	108	78	186	63	20	83	2.8	0.005
July	68	44	112	40	10	50	2.41	0.016

DISCUSSION

This study compared patient experiences in outpatient mental health care via telemedicine versus in-person sessions, focusing on stigma, appointment compliance, satisfaction, and service preferences. Results showed higher satisfaction and lower perceived stigma among telemedicine users. Patients preferred telepsychiatry for its convenience, privacy, and comfort with technology. Telemedicine also improved appointment attendance, highlighting its potential to enhance access, engagement, and continuity of care, especially for those facing logistical barriers consistent with previous studies [22, 24, 25, 26, 27].

IMPLICATIONS FOR PRACTICE AND POLICY

The findings of this study have important implications for mental health practice and policy. First, they support the integration of telemedicine into mental healthcare delivery to meet increasing demand and overcome barriers to traditional service delivery. Second, they underscore the role of telepsychiatry in addressing stigma-related obstacles to care and promoting accessibility and privacy protections. Third, they emphasize the importance of tailoring telemedicine platforms to accommodate diverse patient needs and preferences, including demographic factors like age and education. Finally, they highlight the potential of telemedicine to improve appointment compliance and treatment outcomes, particularly in populations facing logistical or social barriers to clinic visits. These implications are consistent with recommendations by [29] regarding the adoption and normalization of telehealth into everyday care by nursing staff.

LIMITATIONS

Despite its significant contributions, this study is not without limitations. The cross-sectional design limits the ability to infer causal relationships between telepsychiatry and patient outcomes over time it would be better to establish directions through longitudinal randomized trials that track multiple exposures. The study was conducted at one site (Dhafra Family Medicine Center, Abu Dhabi) the findings may not generalize to other UAE regions, rural populations or different healthcare systems. In terms of analysis, simple descriptive comparisons were carried out without taking possible confounding variables into account. More complex modeling with important covariates would help separate the relationships between the intervention and the outcome.

Short data collection window: Only two months (June–July 2023). This timeframe does not account for seasonal, policy, or service delivery variations that may influence results. Future research should address these limitations through longitudinal studies.

Data collection tool is adapted from other tools, local cultural adaptation needs to be clearly demonstrated; stigma domain is limited as 3-item measure oversimplifying the construct; service preference was based on only 4 questions which may not capture patient decision-making, and might fade the measurement tool, future studies must include further detailed sections for the stigma and preferences parts, and further validation.

Self-reported data may be subject to biases such as social desirability or recall inaccuracies. Furthermore, generalizability may be limited by the convenience sampling that is concentrated in a single geographic area. Representativeness would be improved by more extensive multi-site sampling. Sample characteristics restrict its applicability to other demographic groups or geographical areas. Additionally, the study focused on adult outpatients, limiting its applicability to younger populations or inpatient settings. more diverse sampling methods, and broader population coverage.

CONCLUSION

In conclusion, this study provides valuable insights into the impact of telemedicine on patients' experiences in outpatient mental health care, highlighting its potential to enhance satisfaction, lower perceived stigma concerning discomfort discussing emotions/thoughts, embarrassment/shame, and concerns over others discovering their mental health issues, improve service preferences, and promote appointment compliance. By addressing barriers to traditional service delivery and tailoring interventions to meet diverse patient needs- cultural and contextual factors, family dynamics, cultural stigma, and digital literacy- the policy makers and researchers can shape telemedicine use in the UAE, telepsychiatry offers a promising avenue for expanding access to high-quality mental health services. Policymakers and practitioners should embrace telemedicine as a vital tool for improving mental healthcare delivery in the digital era, ensuring equitable access and optimal treatment outcomes for all individuals in need of support, policy initiatives should support awareness-raising campaigns about accessibility and privacy protections in telepsychiatry. System-wide patient experiences could be further improved by tailored telemedicine modalities that take demographic variables like age or education into consideration. Therefore, maximizing population reach could involve implementing more flexible platforms that accommodate different generations comfort levels and digital literacy.

Clinicians must be trained in adaptable telepsychiatry delivery modalities that meet patient needs as well. Telehealth integrated policy reform that addresses long in-person delays could improve treatment outcomes and lower the risk of disengagement. These findings underscore the importance of continuing efforts to integrate telemedicine into mental healthcare practice and policy, with careful consideration of demographic factors and patient preferences.

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STUDENT EXPERIENCE OF THE ADVANCED LEADERSHIP PROFESSIONAL PRACTICE EDUCATION PATHWAY

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ABSTRACT

Many higher education courses designed to develop leadership skills, knowledge and attributes in health and human services are centred on individual skill development and competencies. Organisational needs are not always taken in consideration. Competencies for effective teamwork, collaboration and driving change, are missing from leadership development curricula and educational strategies. The Professional Practice Pathway: Advanced Leadership for Guiding Transformation (PPP) was developed to address these short comings by incorporating work-integrated learning projects, learning circles and mindfulness.

This study evaluates the PPP by investigating effectiveness, focussing on transformed thinking and its translation into transformed behaviours. Qualitative enquiry was used to explore students learning experiences. Five students (63%) from the 2021 PPP cohort participated in this study by taking part in in-depth interviews. Three participants (60%) were female, and all participants were employed in full time roles in health and human services.

Four themes were developed through a thematic analysis approach: enablers for learning, being connected, overcoming barriers, changed leader, and overcoming barriers in leadership transformation. It has become clear that the PPP provided opportunities for a small group of health and human service professionals to learn and change together. Students developed a better understanding of self, reflected on previous, current, and future practice in leadership and were able to build on knowledge and skills by applying their learnings. The creation a positive learning environment contributed significantly to participants leadership development, contributing to effective and efficient workplace practices ultimately leading to better patient and organisational outcomes.

KEYWORDS

leadership education, transformational leadership, higher education, healthcare education, professional practice.

INTRODUCTION

Health and Human Service (H&HS) leadership is a practice and skillset that must be, and can be, intentionally taught [1]. Formal training in the multifaceted components of leadership is now highly desirable for health leaders [2]. Health and human services require a level of leadership that encompasses the ability to identify and respond to a wide range of

complex challenges. Communication is at the core of effective leadership [3] and includes strategic direction, expectation and feedback [4]. Attributes such as empathy, integrity, adaptability, agility, and self-awareness contribute to a transformational thought process and this leadership style has emerged as one of the most prominent for complex organisations such as those in the H&HS sector [5]. The definition of a transformational leader is someone who raises people to higher levels of motivation, making changes and shaping the future. Transformational leaders are more likely to help organisations advance though maintaining a good balance of task behaviours and relationship behaviours [6] as opposed to other types of leaders such as transactional leaders. Leadership models have been shown to be extremely helpful for students to grasp new concepts, make sense of lessons learned through their own experiences and afford structure that facilitates lasting comprehension through reflection, and provide a basis for student assessment and evaluation [7].

Higher education courses designed to develop leadership capability in health and human services traditionally focussed on individual skill development and competencies and there is a recognised need for programs to address the gaps at an organisational and policy level [8]. The requirements necessary to lead health and human service system change, such as competencies for effective teamwork and collaboration, are not reflected in current curricula and pedagogic models used to teach leadership [9]. The COVID pandemic reinforced the need for leaders to have exemplary interpersonal and communication skills [10] and there is increasing importance attached to emotional and social intelligence and creating the right mindset for leadership success [11]. Additionally, a study undertaken by Balwant [12] identified that transformational leadership demonstrated by instructors was positively related to student motivation, perceived instructor credibility, satisfaction with leader, and student learning. Transformative learning involves teaching students how to think critically in contrast to primarily content-based learning.

PROFESSIONAL PRACTICE PATHWAY

The Professional Practice Pathway: Advanced Leadership for Guiding Transformation (PPP) is a year-long program undertaken after successful completion of year one and year two of the Master of Leadership: Health & Human Services (MLHH) or the Master of Healthcare Redesign (MHR). The PPP provides an intensive development program including advanced study, work-integrated learning projects and reflective learning allowing students to demonstrate commitment to, and mastery of, evidence-based leadership practice in their chosen professional field(s) and workplace(s). Pearson [13] suggests that three conditions need to be working in tandem for transformation across teams, organisations, and systems. These are leaders who are exposed to transformed thinking, leaders who have begun to experience inner transformation and those same leaders who have been equipped to begin the process of enabling others that they are working with to also undergo inner transformation. These conditions represent the PPP learning outcomes.

A key aspect of the PPP program is an opportunity for students to practice and integrate their emerging capabilities in transformation through development and implementation of a transformational project in their workplaces. Students in the PPP are expected to develop professional competencies in Advanced Leadership and Guiding Transformation through a program of work integrated learning in professional practice. Work-integrated learning such as this, provides engagement and opportunity in authentic workplaces and provides students the chance to connect theory and practice in real time [14]. A systematic meta-analysis highlighted some of the benefits of work-integrated learning in healthcare includes an increase in productivity suggesting that students were increasing service provision [15]. Conversely, time to complete study in the workplace was identified as the main barrier in a further study [16].

AIM

Evaluation of H&HS leadership higher education courses is important for two main reasons. Firstly, to understand the appropriateness of capability development in students and secondly to ensure the relevance to organisational investment and expectation [17]. Evaluating the PPP will ensure that the program content aligns with students' expectations as well as the expectations and needs of health and human service organisations locally and nationally and that the teaching team are meeting the needs of students at an individual level. Therefore, this study aims to evaluate the effectiveness of the Professional Practice Pathway (Advanced Leadership for Guiding Transformation), particularly transformed thinking and its translation into transformed behaviours.

METHOD

The methodological approach for this study was a qualitative enquiry. This study was approved by the Tasmanian Human Research Ethics Committee Human Research Ethics Committee, Reference H0024296.

PARTICIPANTS

All students who enrolled in the PPP in 2021, the first year of the program ($n = 8$) were eligible to participate.

RECRUITMENT

Students enrolled in the Professional Practice Pathway were invited to participate via email from the program director. All students were required to provide written consent for participation in this study.

DATA COLLECTION

Semi-structured interviews were conducted at the completion of the course. These took place online or in person depending on current circumstances, location, and the preferences of the student. All interviews were audio recorded and transcribed verbatim. The interview topics centred around the three learning outcomes for the program, specifically exploring the student's motivations for enrolling in the program, experience within the program and their own professional development. All interviews were conducted by staff who were not involved in teaching roles within this pathway.

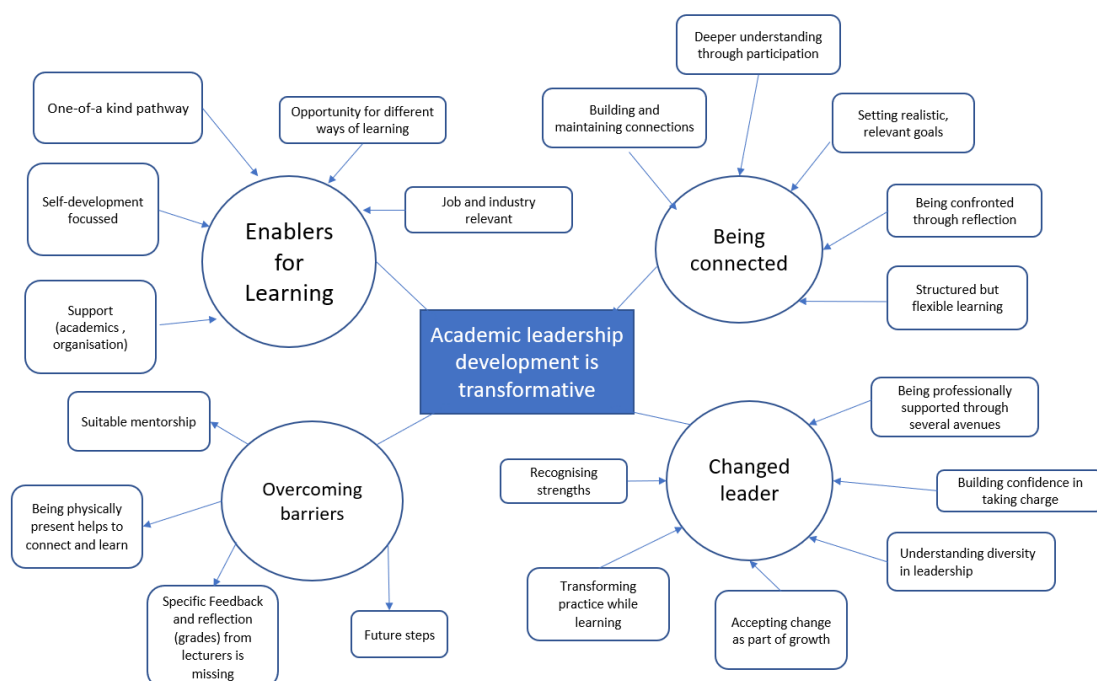
DATA ANALYSIS

Interview data (audio recordings) was transcribed by an external provider (Way with Words) and analysed by the authors using deductive content analysis. We developed a coding framework based on the learning outcomes and interview questions. We used the thematic networks approach [18] to develop basic themes, organising themes and a global theme.

RESULTS

Five students (63%) from the 2021 PPP cohort participated in this study. Three participants (60%) were female, and all participants were employed in full time roles in health and human services. Thematic analysis revealed four organising themes, described below, and one overarching global theme: Academic leadership development is transformative (Figure 1).

FIGURE 1: THEMATIC NETWORK



THEME 1: ENABLERS FOR LEARNING

This theme encompassed the participants thoughts on the type of program they undertook, the impact that has had on them both as individuals and leaders, and the different ways of learning that were provided for students.

Initial attraction to undertaking this pathway was because it was different from anything else being offered in the tertiary sector. Interviewees identified that the traditional research pathway is not for everyone.

I was very excited to be a part of it and get as much as I could out of it, but also the idea of being part of something new was exciting. (P2)

Interested in an alternative pathway versus a traditional research pathway. For me it was more practical. To me this was a more meaningful way to achieve something I would use, beyond the research option (P4)

Participants highlighted the focus within the program on increasing self-awareness and development and how important this was for themselves both as an individual and as a leader.

it was an opportunity for me to really look at who I am and who, I am as a leader and who am I am as a person, so everything just seems to line up and that that's why I signed up to it. (P5)

I think those things that happened during the year through the learning, and then sharing it in the learning circle and seeing other people having the same experience, I think really helped me to just grow as a person (P2).

Small class size was seen as a positive by interviewees as it enabled participants to be vulnerable and share personal experiences in a safe environment.

I think from the class being small and getting to know people so intimately and how they work, which I think is a very unique situation. (P1)

Interviewees stressed the importance of providing opportunities for different ways of learning and the impact this has had on their leadership practice.

just that deep listening and just doing the learning circles and the... Just listening to people better and more intensely and trying to... Taking away what I think they've said and being able to reflect back essentially what they've said, has definitely had big changes on how I lead (P1).

the zoom meetings with learning circles that we had once a month were really good (P3).

the Enneagram and those kind of things, really helped me to understand myself a little bit better and look at where I was at and plan some goals for the year. (P2).

Support from academics, peers and workplace organisations was considered key to enabling student success in the program.

I think the pathway and the learning circles and the relationships I developed through that really helped me from a support perspective (P2).

we've all been very supportive and encouraging and trying to push each other (P4).

I have a workplace that's very open to give support (P1)

Participants agreed that the ability to put learning into practice immediately made the program relevant to their job and hugely beneficial to their development as a leader. The ability to bring information and practical knowledge back into the workplace was seen as encouraging others in the workplace to consider the program. The potential impact on their career both now and into the future was also highlighted by participants.

I really liked that idea that it was very practical, and I'd be able to implement things straight away, not just theoretical (P1)

The project made me put those learnings into reality and a practical application (P2). because I've implemented a lot of it, will continue to do it a lot more than a typical uni course. So, I think it has more lasting, ongoing impacts than other ways I've done uni. (P1).

I wouldn't be where I am today if I hadn't have done that (PPP) (P3).

THEME 2: BEING CONNECTED

This theme focuses on the quality of being connected as a characteristic of pathway content and delivery and which is experienced in a variety of ways by participants. This concept encompassed PPP connection with student context in pathway design and delivery, and the role of facilitating connection with self and with others in supporting leadership transformation. Participants highlighted this aspect of the program and emphasised the function of the relationships formed with each other.

I think one of the special things about the course was that it was so focused on the being together and working with yourself and what you're doing. (P1)

Group activity was viewed as supportive and a forum for learning from each other.

Being on the pathway, being involved with the group, having learning circles and that connection around my leadership journey really kept me on a path in a year that it was really challenging and helped me from a support perspective (P2)

we have just formed such a great bond between all of us and we champion each other, and we call each other we want the best for each other..... we're telling each other and giving advice (P3)

Significantly, the bonds formed were reported to have continued beyond the conclusion of the program, as learning and social networks, and included ongoing connection with the program itself.

one of the big things for me that I felt at the end of the pathway was that I actually didn't want it to end (P2)

we're all still in contact and all sharing our experiences, and you know learning with each other (P5)

i'm still involved now, as most of us are in the learning circles and being mentors for the cohorts because it will only, not only will it benefit others, it will continue to benefit me (P3)

Participants identified their participation in pathway activities, which included sharing reflections, as a way of developing their deeper understanding of leadership, of themselves as leaders and their relationships with others.

doing the learning circles and specifically having a question that you have to think and reflect and discuss with a group, I've then kept thinking about it for weeks after and then that's when I've seen change at work. (P1)

.... the various 360s and the archetype and the Enneagram, I think they all helped us dive a little deeper even for people like me who had a basic understanding. (P4)

the assessments at the start of the pathway around the type of leader you were really helped me to understand myself a little bit better and look at where I was at (P2)

Participants linked the program and insights gained through program activities with realistic and relevant goal setting, appropriate for their context and stage of development.

I thought, you know what, that is right up my street in terms of, you know, reflecting on my management experience, up until now. It was an opportunity for me to really look at who I am and who I am as a leader and who I am as a person (P5)

Understanding where I sit on that [the MLQ] has allowed me to consciously allocate effort to things that I probably could do a little bit better, but in the knowledge that it will take away from something else that I'm doing (P2)

While valued, reflection was described as challenging and often confronting, underscoring the importance of the safety provided by program structure.

I saw things about myself that I had never realised and I felt a bit icky about myself and as I would do things I'd go, oh my God, that's what you're doing.....those kinds of learnings about yourself, although they do feel quite confronting at times, can be really significant (P2)

I think if you're sharing this stuff with 20 people, I don't think you would get the same experience or outpouring from people..... we had a really good group [8 participants], and I think we all accepted that vulnerability together and we all know none of us judge, so we all share. (P5)

Participant comments suggested they experienced the program as a structured but flexible learning environment, and one in which they could integrate different ideas, and ideas with experience.

I think it was well structured it wasn't overbearing. You know, I think it was nice little pieces leading up to, to the major projects (P4)

as a package that we were almost surrounded with, there was all these tools that I could pull out when I needed them during the year for some of these experiences I was having (P2)

THEME 3: BECOMING A CHANGED LEADER

This theme relates to how participants incorporated their learning, contributing to changed behaviours. An important part of this learning relates to not falling back to previous held behaviours and this occurred through reflection and feedback from others and by increased understanding of self.

I guess if you don't understand yourself and how you work and how to better yourself, then your ability to lead others or an organisation is going to be quite limited (P1)

I definitely had comments from other people in the team that they noticed changes with me doing the course and how I responded to situations or how I led. (P1)

Transforming practice while learning occurred through applying strategies and techniques exposed to in the learning circles. Deep listening was one of these strategies implemented into the workplace, leading to enhanced reflective skills. Moreover, these strategies were also taken up by staff members working closely with the participants and these strategies were used to support each other in the workplace. Taking a step back and reflect on how situations were handled led to insights on how to change behaviours. Furthermore, participants came to the realisation that other people have personality traits that are challenging, but the interpersonal techniques learned in the course, meant that participant could handle these traits.

In terms of that relationship building and team building I am probably doing that very differently now. (P5)
It gave me more insight into why people were the way they were and how to try and combat that. (P3)

Participants also articulated that reflective practice had become a routinely carried out activity.

I stop and reflect more than I have ever done in my career. (P2)

Building confidence in taking charge resonated with most participants and recognising own strengths in relation to other leaders was an important contributing factor to become a confident leader. Participants also allocate efforts to improve leadership actions in their roles.

I have become a more confident leader and more aware of... I think I knew what my strengths... Well, I did know what my strengths were before but being confident that I don't have to have the same strengths as other people. (P1)

If I had gone into this position before I started the course, I think I would have really struggled.

Confidently and effectively engaging with senior leaders and executive leaders occurred through articulating arguments more clearly, which was learned and practised in the course. Handling challenges and disappointments by learning to put them in perspective, contributed to more confidence.

...I applied for a job and didn't get it...I used that as a learning rather than a negative outcome. (P2)

Being engaged in the activities of the course for a period of 12 months and actively sharing learning, receiving feedback and observing other people with a similar experience contributed to growing as a person. As a result of sharing learning a strong bond between the participants was formed, continuing after the course ended.

To this day we all still talk. We have a whatsapp group.... There wouldn't be many days in the week when someone isn't communicating. (P4)

THEME 4: OVERCOMING BARRIERS IN LEADERSHIP TRANSFORMATION.

This theme focuses on the barriers that participants identified as part of their journey through the professional practice pathway and its relation to leadership transformation. Most of these barriers were related to structure and delivery rather than content and provide a range of opportunities for improvement. As part of the pathway, each student is allocated a mentor, someone to guide them through the process of transformation and work with them to develop their leadership skills. Some participants questioned whether the mentor that they were allocated was suitable, they felt that their needs were not being met.

"My mentor wasn't suitable for me... There wasn't a great match, I really wanted someone to push me to that next level" (P4)

One of the main barriers to transforming, and taking their new skills to the next level, was a lack of future direction. Participants suggested that they needed a better understanding of how this type of transformational leadership knowledge and skill set can be utilised in the real world and where opportunities might arise for them.

"When we got to the end, we could be so much more, but we had no understanding of where to go" (P3)
"I wanted someone to give advice on how to jump to the next level roles that we were all chasing" (P4)

It was noted that this pathway is most beneficial for people who are already in leadership roles, wanting to build their career further into the director or executive space but the pathway is not promoted in this way. There is a need to ensure that people entering this pathway are aware of the potential outcomes and outputs for them personally and professionally.

"I think that at that level, service director level, it's a really beneficial thing to do (the pathway), but its not sold that way"
(P2)

"I would not recommend doing the pathway to someone who is 2 or 3 years out. I think you need to be slightly up the chain" (P5)

Some more technical, course related barriers were also identified as part of the structure and delivery modalities. This pathway is offered both face to face and virtually and participants who solely joined on a virtual platform felt that they would have achieved more by being in the room. The size of the group was also highlighted as an enabler in this cohort but noting that a larger group may have made it difficult for the learning to occur as specifically as it did.

"The opportunity to be in the room would have made it easier" (P2)

"We had a really good group...one thing I would say is don't get any bigger. I think if you get bigger than that you will lose the intimacy" (P5)

Similarly, a gap was identified in the way in which assessment tasks were graded and feedback provided. Participants were undertaking a master's level course and felt that it was important to receive a numeric grade on each assessment task rather than a Pass/Fail, which was the design utilised within the pathway.

I hate pass fail.... I really think it needs to be graded. I want to know just passed, you know that I pass really well and if I'm not passing well, I want to be able to improve on how I can get better.

I felt like it was a cop out at a master's level to just be a pass fail (P5)

DISCUSSION

This paper aimed to evaluate the University of XXX Professional Practice Pathway: Advanced Leadership for Guiding Transformation (PPP) through understanding student expectations and experience. Our findings demonstrate that the PPP has successfully transformed the leadership practice in a variety of ways. Although there were some barriers identified, overall, the PPP was an exciting new opportunity that involved a small group of health and human service professionals learning and changing together.

The reported enablers for learning are consistent with previous studies that suggest support, relevance and usefulness are the key factors that influence experience in higher education [19,20]. Further, Khayat [21] demonstrates that planning and reflection are two key components of successful self-regulated learning. The participants in our study were motivated to enrol in the PPP to learn in new ways, challenging traditional leadership education approaches. The PPP provided students with many opportunities to develop a better understanding of self, to reflect on previous, current, and future practice in leadership and build on knowledge and skills by applying their learnings in real time. This finding is consistent with Van Dam & Ford's [22] work who developed a leadership learning theory responding to the opportunities, including a four-stage learning process. Central to this process is reflection on self and feedback and transfer of learning, contributing to leadership development.

Within the PPP leadership transformation was facilitated by the creation of a positive learning environment where vulnerability and openness were encouraged and supported. A recent leadership study by Kilgus et al [23] emphasised that creating a positive and engaging learning environment improves students' motivation and achievement. This highlights the notion that creating a positive learning environment is central to leadership development. Participation in meaningful group activities allowed students a connectedness not commonly associated with a higher education course. This educational strategy ensured a positive student experience that, contributed to participants developing leadership

skills. Therefore, it is important that these strategies should be incorporated in university leadership courses, as it encourages reflection and learning, resulting in better organisational outcomes [24]. Moreover, Gravett and Winstone [25] highlighted that meaningful, personal interactions in higher education positively impact student experiences. Further, Yale [26] demonstrates the importance of the teacher/student relationship in higher education and its influence on student outcomes. She suggests that when students feel supported and encouraged, they develop higher academic self-concept and are more motivated to continue on their learning journey. This is consistent with our findings and the sense of belonging and connection that students felt both from their peers and from their teachers and mentors. Collective learning is an important part of the PPP and contributed to the positive learning experience and the individual change that participants reported. In practice, where leadership roles are more commonly being shared, this collective thinking and learning are important education components for successful transformation [27].

The empirical effectiveness of transformational leadership stems from the use of empowerment rather than control, a behaviour not easily taught via traditional educational approaches. A strength of the PPP is the continuous opportunities for reflection and peer feedback to understand self [22]. It has demonstrated the importance of this type of reflection in the development of transformational leadership behaviour and the personal and professional change that is needed to drive this change. Students in the PPP engage in activities designed to maximise their strengths and recognise and understand their limitations as part of a behaviour change strategy. Our findings suggest that behaviour change was linked to shared learning, connection and applying the range of techniques included in the curriculum, such as deep listening [28].

Although, overall, our findings highlighted positive experiences and outcomes within the PPP, the reported barriers suggest there are opportunities to improve the student experience. Higher education aims to prepare students for a role aligned to their interests and new expertise. Students undertaking the PPP are potentially looking for career advancement and making a positive change to the organisation they are employed with. To address these expectations leadership educators will need to have a good understanding of the students' organisational context and this understanding can be created by forging strong partnerships with health and human services organisations [29].

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INVESTIGATION OF THE RELATIONSHIP BETWEEN STRESS, WORKLOAD, MEDICAL ERROR TENDENCY AND PERCEIVED QUALITY OF CARE IN SURGICAL NURSES

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ABSTRACT

OBJECTIVE:

The study investigated the relationship between stress, workload, tendency to make medical errors, and perceptions of quality of care among surgical nurses.

METHODS:

The study has a cross-sectional, descriptive, and correlational design, involving a sample of 432 nurses working within surgical wards across two university hospitals in Türkiye. Data were collected from February 15, 2023, to December 31, 2023. The Nurse Stress Scale (NSS), the Workload Scale (WLS), the Tendency to Medical Error Scale (TMES), and the Caring Behaviors Inventory-24 (CBI-24) were used to collect data.

RESULTS:

It was determined that the frequency of stress and workload experienced by surgical nurses were moderate, their tendency for medical errors was low, and their perception of quality of care was high. A significant negative correlation was observed between the total score of TMES and the NSS total score ($r = -0.084$, $p = 0.048$) and the WLS total score ($r = -0.091$, $p = 0.046$). Additionally, a significant positive correlation was observed between the total score of TMES and the CBI-24 total score ($r = 0.116$, $p = 0.015$).

CONCLUSIONS:

It was determined that surgical nurses' stress levels, workload perceptions, medical error tendencies, and care quality perceptions were related to each other. Both individual and institutional arrangements to be made in line with these recommendations will make a significant contribution to increasing the quality of care, which is the key point of nursing practices, and to reducing the rates of tendency to medical errors, which is a quality indicator.

KEYWORDS

medical errors, surgical nurses, occupational stress, quality of care, workload, Türkiye

INTRODUCTION

It is known that nurses working in surgical clinics perceive stress in the workplace more intensely, which is considered a global threat [1,2,3]. This situation arises due to individual and organizational factors such as heavy workloads, staff shortages, and interpersonal conflicts, as well as the need for nurses working in surgical clinics to make quick and critical decisions and the fact that surgical clinics are high-risk work environments due to exposure to infections or hazardous materials [2, 4, 5, 6]. Studies on this topic emphasize that nearly half of nurses working in surgical clinics experience high levels of stress, and that excessive workload is particularly associated with perceived stress [3,7, 8].

It has been shown that excessive workload not only increases nurses' perception of stress, but also increases the likelihood of medical errors by causing physical fatigue or distraction [6,9]. Medical errors can lead to situations that threaten patient safety, ranging from minor issues to serious injuries and even death [10]. Examples of medical errors that can threaten patient safety include failure to verify patient identity, inappropriate medication administration, incorrect record keeping, patient falls, transfusion errors, and hospital infections [11]. Given the critical and rapid decision-making requirements in surgical clinics and the complexity of surgical patient care, the risk of encountering such medical errors can be high [12]. Nurses' high stress levels, excessive workload, and risk of medical errors negatively affect the quality of care, which is the most important outcome of the nursing profession [13,14]. A study found that the vast majority of surgical patients had a positive perception of nursing care and emphasized that adequate staffing levels were among the factors affecting the perception of care quality. This situation indicates that there is a relationship between surgical nurses' workload and their perception of care quality [15]. Another study noted that high workload perception not only increases the likelihood of medical errors but also negatively affects nurses' clinical decision-making processes, and therefore, interventions targeting such emotional and physical stressors should be planned [16].

Providing high-quality healthcare depends on ensuring both the quality and safety of patient care. Therefore, it is essential to address the competence of nursing staff, reduce workload and stress, and minimize medical errors in order to maintain quality and safe patient care. In particular, there are no comprehensive studies in the current literature examining the interrelationships between stress, workload, tendency toward medical errors, and perceptions of care quality among surgical nurses. Therefore, the aim of this study was to investigate the relationships of surgical nurses' stress, workload, medical error proneness, and perceptions of quality of care among nurses in surgical clinics.

This study investigated surgical nurses' stress levels, workload perception levels, medical error tendencies, factors contributing to medical errors, perceptions of care quality, and the relationship between stress levels, workload perception levels, medical error tendencies, and perceptions of care quality.

METHODS

STUDY DESIGN AND LOCATION

This study employed a cross-sectional and correlational design and was conducted in two university hospitals in different geographical regions of Türkiye .

STUDY POPULATION AND SAMPLE

The population of this study consists of 600 surgical nurses working in two university hospitals. No sampling method was used, as the aim was to reach the entire population. The inclusion criteria for the study were working in surgical units and voluntarily participating in the study, while the exclusion criteria were being on leave or sick leave during the study period, incomplete questionnaires, and not voluntarily participating in the study. In this context, the study sample consisted of 432 surgical nurses who were available during the specified time period and met the inclusion criteria, representing a participation rate of 72%.

STUDY INSTRUMENTS

In this study "Descriptive Information Form for Nurses," the "Nursing Stress Scale," the "Workload Scale," the "Medical Error Tendency Scale," and the "Caring Behavior Inventory-24 (CBI-24)" were used as study instrument to collect data.

Nursing Stress Scale (NSS): The stress experienced by nurses in hospital settings was assessed using the scale designed by Gray-Toft and Anderson in 1981 [17], which was subsequently validated and proven reliable for Turkish use by Mert, Aydın-Sayılan, and Baydemir in 2020 [18]. The scale comprises 34 questions grouped into 7 factors. In the current study, the total scale score of Cronbach's alpha reliability coefficient was calculated at 0.946. The total score on the scale assesses the overall frequency of stress experienced by a nurse and is computed by summing the responses to all items. Higher total score on the scale shows more frequent experiences of stress across various physical, psychological, and social stressors. [18].

The Workload Scale (WLS): Created by Duxbury and Higgins in 1994, the scale assesses the workload, incompatibility, and perceived lack of control in participants' work. Consisting of 11 items, the scale has factors such as time, knowledge, skills, and responsibilities required for the job, and work intensity and the individual's perception of workload. The scale ranges from a minimum score of 11 to a maximum of 55. Each item prompts individuals to indicate their level of agreement and perception of workload by selecting the most appropriate number. A higher score on the scale signifies a greater perceived workload and a reduced capacity to tolerate the job [19]. The Turkish validity and reliability of the scale were established by Ayca and Eskin in 2005. Cronbach's alpha reliability coefficient of the scale was 0.82 for the original scale [20] and 0.87 for this scale.

The Tendency to Medical Error Scale (TMES): The scale was devised by Özata and Altunkan in 2010 to assess nurses' tendency toward making medical errors. It comprises 49 items organized into five subdimensions, reflecting routine patient care activities. The overall Cronbach Alpha coefficient for the scale is 0.95, demonstrating high internal consistency [21]. In the current study, the Cronbach alpha reliability coefficient for the scale was 0.93.

The Caring Behaviors Inventory-24 (CBI-24): The CBI-24 is a short version of the "Caring Behaviors Scale" with 42 items, designed for mutual assessment by both patients and nurses, developed by Wu et al. in 2006 [22]. Its Turkish validity and reliability study was performed by Kurşun and Kanan in 2012. The total scale score is computed by summing the scores of all 24 items and dividing by 24. Higher total and subdimension scores indicate better perceived quality of care by either patients or nurses [23]. The Cronbach alpha reliability coefficient for nurses was 0.96 [23] in the original study and 0.92 in this study.

DATA COLLECTION

Data were collected from surgical nurses in the relevant hospitals between February 15, 2023, and December 31, 2023, using data collection forms by face to face and online methods.

In the first study location; study's purpose, methodology, and anticipated benefits were outlined in an Informed Voluntary Consent Form provided to participants, reported that filling the study instruments would be take approximately 10 minutes and study instruments these forms were distributed in sealed envelopes at the nurse desks in the surgical wards. Voluntary nurses completed Informed Voluntary Consent Form and all study instruments then placed it back in the envelope, and returned it to the nurse's desk.

In the other study location; face-to-face interactions were restricted due to COVID-19 safety measures, data collection forms were distributed to nurses using an online platform (Google docs form). Online forms were shared with participants via social networking platforms and messaging applications (Instagram, Facebook, and WhatsApp). The survey was structured in a way that participants could not move on to the next question without answering the current question.

In the study, face-to-face and online data collection methods were used, and various measures were taken to minimize the risk of bias in participant responses. First, participants were informed of the purpose of the study, that the data would

be used solely for scientific purposes, and that their personal information would be kept strictly confidential. Valid and reliable scales were used, and the questions in the information form created by the researcher were prepared in a neutral manner, avoiding leading statements; positive and negative statements were distributed in a balanced manner. The order of the questions and scales was randomized in the online form. In face-to-face applications, forms with the same content but different question and scale orders were used to ensure variability among participants. During the face-to-face data collection process, all administrators were given standard guidelines and approached participants with a neutral tone of voice and body language. In online surveys, attention control items (questions that would create inconsistencies) were added to confirm that participants read and answered the questions carefully. After data collection, inconsistent responses, forms completed in an excessively short time, and straight-lining (consistently identical responses) were identified and excluded from analysis. Additionally, systematic differences between face-to-face and online datasets were examined, and potential bias effects were evaluated.

ETHICAL CONSIDERATIONS

The study received ethical approval from the Kocaeli University Non-Interventional Clinical Research Ethics Committee under decision number KU GOKAEK-2023/03.22, dated 09.02.2023. Institutional permission was also obtained from both two hospitals. Written and verbal informed consent was received from the scale's developers and the nurses.

STATISTICAL ANALYSIS

The IBM SPSS 20.0 package program was used for statistical analysis (IBM Corp., Armonk, NY, USA). Normal distribution conformity was assessed using the Kolmogorov-Smirnov test. Numerical variables were presented as median (25th-75th percentile) and frequency (percentages). Cronbach's alpha coefficients were calculated to assess the internal consistency and reliability of the scales. For comparisons between variables not following a normal distribution, the Mann-Whitney U test and Kruskal-Wallis test were applied. The relationship between numerical variables was examined using Spearman correlation analysis. A significance level of $p < 0.05$ was accepted as significant in two-way tests.

RESULTS

The demographic characteristics of surgical nurses revealed a median age of 31.0 years, a median length of service in the clinic of 2.0 years, and a median weekly working hours of 45.0. 88.7% were female, 65.7% were married, 58.3% held a bachelor's degree, 55.5% worked in surgical services, 87.5% expressed willingness to continue nursing, 88% were willing to remain in their current clinic, and 69% worked both day and night shifts (Table 1).

TABLE 1. DESCRIPTIVE CHARACTERISTICS OF NURSES (N=432) (MEDIAN (25.-75. PERCENTILE) / N (%))

Characteristics		Median (25. – 75. percentile)	
Age		31.00 (18.00-55.00)	
Work experience in the current clinic (year)		2.00 (1.00-5.00)	
Weekly working hours		45.00 (8.00-170.00)	
		n	%
Gender	Female	383	88.7
	Male	49	11.3
Marital status	Single	148	34.3
	Married	284	65.7
Education level	Health Vocational High School	94	21.8
	Associate degree	50	11.6
	Bachelor's degree	252	58.3

	Postgraduate	36	8.3
Current clinic	Operating room	54	12.5
	Surgical services	240	55.5
	Surgical intensive care units	111	25.7
	Emergency service	27	6.3
Practicing nursing willingly	Yes	378	87.5
	No	54	12.5
Working willingly in the current clinic	Yes	380	88.0
	No	52	12.0
Working pattern	Day shift	121	28.0
	Night shift	13	3.0
	Day and night shifts	298	69.0
Total		432	100.0

Surgical nurses' stress scores [76.00 (67.00-86.00)] were at an average level, their workload perception scores [36.00 (30.75-41.00)] were slightly above average, their tendency to medical errors was above average [241.00 (228.00-245.00)] and their care quality perception levels [5.25 (4.83-5.62)] were at an average level (Table 2). The study showed that surgical nurses' stress levels were average [76.00(67.00-86.00)], while their workload perception scores were slightly above average [36.00(30.75-41.00)]. Additionally, nurses' tendency toward medical errors was above average [241.00(228.00-245.00)], and their perception of quality of care was at an average level [5.25(4.83- 5.62)] (Table 2).

TABLE 2. MEDIAN SCORES OF THE NSS, THE WLS, TMES AND THE CBI-24 (N=432) (MEDIAN (25.-75. PERCENTILES) / N (%))

Scales	Scale Subdimensions	Median (25. – 75. percentiles)
NSS	Uncertainty Concerning Treatment	16.00 (16.00-20.00)
	Workload	15.00 (12.00-18.00)
	Death of the Patient	12.00 (10.00-15.00)
	Conflict with the Physician	10.00 (10.00-13.00)
	Conflict with Other Nurses	10.00 (10.00-12.00)
	Lack of Support	6.00 (5.00-7.00)
	Patient Suffering	5.00 (4.00-6.00)
	The Nursing Stress Scale Total Score	76.00 (67.00-86.00)
WLS Total Score		36.00 (30.75-41.00)
TMES	Medication and Transfusion Applications	90.00 (87.00-90.00)
	Prevention of Infections	60.00 (56.00-60.00)
	Patient-Follow-up and Material-Device Safety	45.00 (39.75-45.00)
	Prevention of Falls	25.00 (22.00-25.00)
	Communication	25.00 (24.00-25.00)
	The Tendency to Medical Error Scale Total Score	241.00 (228.00-245.00)
CBI-24	Assurance	1.75 (1.62-1.91)
	Knowledge-skill	1.16 (1.08-1.25)
	Respectfulness	1.29 (1.16-1.41)
	Connectedness	1.04 (0.91-1.16)
	The Caring Behaviors Inventory-24 Total Score	5.25 (4.83- 5.62)

CBI: The Caring Behaviors Inventory-24; NSS: The Nursing Stress Scale; WLS: The Workload Scale; TMES: The Tendency to Medical Error Scale

Regarding the relationship between certain characteristics of surgical nurses and their total scale scores, a significant negative correlation was observed between nurses' age and the median total score on the WLS ($r = -0.142$, $p = 0.003$), a significant positive relationship was observed between weekly working hours and the WLS total score ($r = 0.163$, $p = 0.001$), a

significant positive correlation between CBI-24 total scores and TMES scores ($r = -0.116$, $p = 0.015$), along with a negative weak correlation between TMES and NSS total scores ($r = -0.084$, $p = 0.048$) and between TMES and WLS total scores ($r = -0.091$, $p = 0.046$), (Table 3).

TABLE 3. THE RELATIONSHIP BETWEEN CERTAIN CHARACTERISTICS OF SURGICAL NURSES AND THE MEDIAN SCORES OF THE CBI-24, TMES, NSS, AND WLS (N=432)

		Age	Work experience in the current clinic	Weekly working hours	CBI-24	TMES	NSS	WLS
r (p)*								
Age	r	-	0.503	-,256	-0.018	-0.010	0.063	-0.142
	p		<0.001	<0.001	0.711	0.829	0.183	0.003
Work experience in the current clinic	r			-0.132	0.048	0.031	0.033	-0.044
	p		-	0.005	0.312	0.518	0.484	0.354
Weekly working hours	r				0.075	-0.079	-0.011	0.163
	p			-	0.113	0.096	0.817	0.001
CBI-24	r					0.116	-0.023	0.058
	p				-	0.015	0.633	0.224
TMES	r						-0.084	-0.091
	p					-	0.048	0.046
NSS	r							-0.009
	p						-	0.852
WLS	r							
	p							-

*: Spearman Correlation Analysis;

CBI: The Caring Behaviors Inventory-24; NSS: The Nursing Stress Scale; WLS: The Workload Scale; TMES: The Tendency to Medical Error Scale; *Bold faced values are shown as $p < 0.05$

In the study, a comparison of total scale scores based on specific characteristics of surgical nurses revealed several significant findings. The median WLS total score differed significantly depending on the clinic where the nurses worked ($p < 0.001$). Nurses in surgical intensive care had significantly higher workload scores than those in the emergency department ($p = 0.015$), operating theatre ($p = 0.002$), and surgical ward ($p = 0.027$). Nurses who practiced willingly showed significantly higher WLS scores ($p = 0.003$), and those who engaged in nursing willingly had significantly lower WLS scores ($p = 0.001$). Nurses working willingly in their current clinic had significantly higher TMES scores ($p = 0.047$), and those working willingly in their current clinic had significantly lower WLS scores ($p < 0.001$). Additionally, a significant difference in WLS scores was found based on the nurses' working style ($p < 0.001$), (Table 4).

TABLE 4. COMPARISON OF MEDIAN SCORES OF SURGICAL NURSES ACCORDING TO SOME CHARACTERISTICS OF CBI-24, TMES, NSS, AND WLS (N=432) (MEDYAN (25.-75. PERSENTIL))

Characteristics		NSS	TMES	CBI-24	WLS
Gender	Female	77.00 (67.00-87.00)	242.00 (229.00-245.00)	126.00 (116.00-135.00)	35.00 (30.00-41.00)
	Male	75.00 (68.00-83.50)	238.00 (220.00-245.00)	126.00 (116.50-134.00)	37.00 (32.50-39.50)
	p ^a	0.373	0.167	0.830	0.657
Marital status	Single	75.00 (65.75-86.25)	242.50 (229.00-245.00)	125.00 (113.75-135.00)	36.50 (31.00-40.00)
	Married	76.00 (68.00-86.00)	240.00 (228.00-245.00)	126.00 (118.00-134.00)	35.00 (30.00-41.00)

Education level	p ^b	0.105	0.600	0.229	0.072
	Health Vocation al High School	75.00 (67.00-84.25)	243.00 (228.00-245.00)	125.00 (112.00-136.00)	35.50 (29.00-40.00)
	Associate degree	74.00 (63.75-86.00)	243.50 (229.00-245.00)	127.50 (117.75-134.25)	34.00 (29.75-39.00)
	Bachelor's degree	77.00 (68.00-87.00)	240.00 (227.00-245.00)	125.00 (116.00-135.00)	36.00 (31.00-41.00)
	Postgraduate	75.00 (64.50-87.50)	240.50 (227.00-244.75)	126.50 (120.00-133.00)	35.00 (29.00-41.25)
	p ^b	0.580	0.251	0.869	0.147
Current clinic	Operating room	75.00 (66.50-83.00)	242.00 (234.50-245.00)	126.00 (117.00-137.00)	34.00 (26.50-39.00)
	Surgical services	76.00 (66.00-87.00)	241.00 (227.00-245.00)	126.00 (117.00-135.00)	35.00 (31.00-40.00)
	Surgical intensive care units	78.00 (68.00-88.00)	239.00 (228.00-245.00)	125.00 (114.00-134.00)	39.00 (32.00-44.00)
	Emergency service	76.00 (69.00-87.00)	244.00 (234.00-245.00)	126.00 (111.00-136.00)	35.00 (27.00-39.00)
	p ^b	0.402	0.363	0.903	p<0.001
	p ^c				p=0.015* p=0.002** p=0.027***
Practicing nursing willingly	Yes	76.00 (67.00-86.00)	242.00 (229.00-245.00)	126.00 (117.00-135.00)	35.00 (30.00-40.00)
	No	78.00 (68.00-88.00)	235.00 (219.75-243.00)	123.00 (112.00-134.25)	39.00 (34.00-43.00)
	p ^a	0.457	0.003	0.235	0.001
Working willingly in the current clinic	Yes	76.00 (67.00-86.00)	242.00 (229.00-245.00)	126.00 (116.00-135.00)	35.00 (30.00-40.00)
	No	77.50 (67.25-88.00)	239.50 (215.75-245.00)	124.50 (112.25-136.50)	40.50 (34.25-43.75)
	p ^a	0.593	0.047	0.607	p<0.001
Working pattern	Day shift	76.00 (68.00-88.00)	242.00 (228.00-245.00)	127.00 (116.00-136.00)	33.00 (28.00-39.00)
	Night shift	80.00 (68.00-89.00)	243.00 (238.00-245.00)	123.00 (117.50-135.00)	32.00 (28.50-42.50)
	Day and night shifts	76.00 (67.00-85.00)	241.00 (228.00-245.00)	126.00 (116.00-134.00)	37.00 (32.00-41.75)
	p ^b	0.722	0.489	0.834	p<0.001

CBI: The Caring Behaviors Inventory-24; NSS: The Nursing Stress Scale; WLS: The Workload Scale; TMES: The Tendency to Medical Error Scale

^a: Mann-Whitney U Test; ^b: Kruskal-Wallis Test

^c: Multiple Comparison Test; *: Emergency service - Surgical intensive care units, **: Operating room - Surgical intensive care units, ***: Surgical services – Surgical intensive care units

*Bold faced values are shown as p< 0.05.

DISCUSSION

This study investigated the relationship between surgical nurses' stress levels, perceived workload, tendency to make medical errors, and perceived quality of care. The study findings revealed that surgical nurses' stress levels and perceived

quality of care were moderate, while their perceived workload and tendency to make medical errors were above average. Additionally, it was observed that an increase in surgical nurses' tendency to make medical errors reduced their perception of care quality and increased their workload and stress levels.

Surgical units are known for their complexity and high stress levels due to the high level of exposure to physical, biological, and psychological risks that require quick decision-making and the intensive care needs of patients. These factors contribute to a heavier workload compared to other units [24]. The literature frequently emphasizes that nurses' high workload levels increase and exacerbate the stress they experience at work [18,25]. Contrary to these findings, a study by Ozyer and colleagues (2020) examining the effects of workload perception and occupational stress on the attitudes of surgical clinic nurses found that neither work stress nor workload perception affected attitudes toward medical errors [26]. Similarly, our study also found that stress levels did not affect perceived workload. This finding is consistent with Ozyer et al.'s results [26] and may be attributed to the fact that the surgical nurses in our sample reported average stress levels and slightly above-average perceived workload. It is important to reduce or control the risks to which surgical nurses are exposed in order to minimize their stress levels and perceived workload.

Excessive workload is one of the main causes of high stress levels among nurses and is associated with more frequent medical errors [27]. Nurses' workload and medical errors in their work environment also affect the quality of care [28]. Previous studies have shown a significant relationship between nurses' perceptions of their individual workload and their tendency to make medical errors [27,29,30]. Sabzi et al. (2019) examined medication error rates and their relationship with the complexity of care in a pediatric hospital and found a relationship between medication calculation errors ($r = 0.22$, $p = 0.03$) and incorrect medication administration ($r = 0.31$, $p = 0.00$) and the complexity of nursing care [31]. Our study supports these findings [31, 32,33, 34] and shows that high perceived workload among surgical nurses is associated with an increased tendency toward medical errors, while low perceived care quality is associated with an increased frequency of medical errors. The slightly above-average perceived workload and medical error tendencies observed among surgical nurses may have influenced these results (Table 2). Additionally, factors such as age, weekly working hours (Table 3), type of clinic, desire to practice nursing, desire to work in the current clinic, and work style (Table 4) also contributed to these results. These results are important in highlighting the need to plan initiatives that will increase the motivation of surgical nurses in the workplace.

Job stress is a major contributor to physical and mental health issues among nurses and can negatively impact patient safety [35]. Studies have shown that stressed nurses are more likely to make errors [33, 34], with research indicating that the tendency for medical errors increases alongside rising stress levels [3, 35]. However, a contrasting study by Ozyer et al. (2020) found that neither workload perception nor work-related stress influenced the medical error attitudes of nurses working in surgical clinics [26]. Consistent with the findings of Cerit et al. (2022), our study observed that an increase in stress levels among surgical nurses was associated with a higher tendency for medical errors [3]. This may be linked to the above-average rate of medical error tendencies noted in our study (Table 2), as well as factors such as nurses not willingly practicing or working in their current clinic (Table 4). Given that excessive stress can trigger medical errors in nursing practice, it is recommended to implement institutional strategies aimed at maintaining stress at manageable levels, including boosting motivation through supportive programs, enhancing working conditions, developing guidance policies for decision-making, sustaining team dynamics, and providing robust guidance and counseling services to help nurses manage stress effectively.

The workload of nurses is a critical factor in ensuring patient safety and guaranteeing the quality of care [5,36]. Studies have shown a relationship between nurses' workload and the quality of nursing care. A high patient-to-nurse ratio is associated with adverse events and decreased patient satisfaction. Additionally, an imbalance between the number of hospital staff and nurses' workload can negatively affect service quality, and high workload often leads to a decline in care quality [14,37]. Numerous studies have confirmed that increased workload is associated with a decline in patient care quality [36]. However, Abd El-Hamid et al. (2019) noted that there was no significant relationship between nurses' workload and care quality [37]. The literature emphasizes the importance of acknowledging the critical role of nursing managers in identifying and continuously monitoring factors affecting nursing care quality, implementing effective

strategies, and improving care standards [36]. In our study, consistent with the findings obtained by Abd El-Hamid et al. (2019), no relationship was found between nurses' perceptions of workload and their perceptions of care quality. According to our findings, surgical nurses' workload perceptions were slightly above average, while their perceptions of care quality were at average levels (Table 2). In particular, nurses working in the NICU, those who did not voluntarily work in the current clinic, and those assigned to both night and day shifts had higher workload (Table 4). However, this increased workload did not appear to be sufficient to negatively affect perceptions of care quality. This situation indicates that surgical nurses strive to fulfill their professional nursing roles under all conditions and prioritize care practices, which are the most important outcome of nursing interventions. In this process, it is recommended that institutional and unit managers plan initiatives to encourage nurses, as this will be effective in improving patient outcomes and expectations.

Work stress can affect nurses' care due to increased activity, workload, and responsibilities [13,33,38]. Work stress can have both direct and indirect effects on the delivery of nursing care and patient outcomes [33]. However, Rizkianti et al. (2020) found no significant relationship between workload, work stress, and nursing care [39]. Our study supports this (Table 3), and the average stress levels reported by surgical nurses in our study can be explained by their perception of high care quality (Table 2). In conclusion, surgical nurses may experience job stress and varying levels of workload, but these factors do not appear to affect their perception of care quality. There are many factors that influence stress. The results of this study can be interpreted as indicating that surgical nurses are able to manage their stress well in the clinical setting and do not reflect stress onto their work. However, further studies are needed that examine the individual factors causing stress and their impact on nursing interventions.

CONCLUSION

In this study, it was concluded that an increase in the level of work stress and workload of surgical nurses increases the tendency to make medical errors, whereas an improvement in the perception of the quality of care decreases the likelihood of medical errors. Based on these findings, it is recommended that nurses' working conditions should be optimized, socioeconomically empowered and institutional and governmental policies should be developed to reduce workload and stress, and that they should be individually aware of stress management strategies and be able to apply these strategies. Both individual and institutional arrangements to be made in line with these recommendations will make a significant contribution to increasing the quality of care, which is the key point of nursing practices, and to reducing the rates of tendency to medical errors, which is a quality indicator. In addition to workload and work stress, more studies are needed to examine factors that may influence the perceived quality of care for surgical patients and reduce the tendency of surgical nurses to make medical errors.

ACKNOWLEDGMENTS

We would like to thank Dr. Canan BAYDEMİR for her contribution to the statistical analysis and all surgical nurses who participated in the study.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

The authors declare that no funding was provided for this study.

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COMPARISON OF THE INCIDENCE AND RISK FACTORS OF ACUTE CORONARY SYNDROME IN JAPAN AND THAILAND: A RETROSPECTIVE COHORT STUDY

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ABSTRACT

BACKGROUND:

Acute coronary syndrome (ACS) is a leading cause of premature mortality worldwide. Incidence is declining in high-income nations but rising in low- and middle-income countries, highlighting the need for cross-country comparisons to inform prevention strategies.

OBJECTIVE:

To compare the incidence and risk factors of ACS between Japan and Thailand.

DESIGN AND SETTING:

A retrospective cohort study included 93 ACS patients from Burapha University Hospital, Thailand, and 177 from Wakayama Medical University, Japan, between January and December 2021. Participants were recruited using purposive sampling.

MAIN OUTCOME MEASURES:

Data from electronic medical records and meteorological databases were analyzed using descriptive statistics, chi-square/Fisher's exact test, Student's t-test, and Pearson's correlation.

RESULTS:

There was no significant difference in the onset time of ACS between Japan and Thailand. Japanese patients were older, had more comorbidities, and more frequently presented with STEMI (66% vs. 24%), whereas Thai patients were younger, had a higher BMI (24.3 vs. 22.9 kg/m²), and more often presented with NSTEMI. In Thailand, meteorological analysis revealed negative correlations between temperature and humidity ($r = -0.607$, $p < 0.001$), atmospheric pressure and humidity ($r = -0.502$, $p < 0.001$), and temperature and pressure ($r = -0.356$, $p < 0.001$).

CONCLUSIONS:

Although ACS onset time did not differ, notable demographic, clinical, and meteorological variations were observed between Japan and Thailand. Japanese patients were older with more comorbidities and more STEMI, whereas Thai patients were younger with higher BMI and more NSTEMI; meteorological factors correlated with ACS onset in Thailand, underscoring the need for tailored, country-specific prevention strategies.

KEYWORDS

acute coronary syndrome; epidemiology; risk factors; Thailand; Japan

INTRODUCTION

Acute coronary syndrome (ACS) is defined as reduced blood flow to the coronary myocardium, encompassing ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), and unstable angina (UA) [1–3]. ACS remains a leading global cause of morbidity and mortality, with worldwide deaths projected to reach 23 million annually by 2030 [4]. The burden is disproportionately high in low- and middle-income countries (LMICs) [5], where limited resources and health system constraints exacerbate outcomes.

Global epidemiological data highlight substantial geographic disparities. In 2020, age-standardized mortality rates from ACS were especially elevated in Africa, Asia, Latin America, and the Caribbean compared with Europe, North America, and Oceania. Moreover, premature mortality before age 70 years occurs more frequently in men than in women [5]. Regional data further underscore these differences. In Japan, population-based registries estimate the age-adjusted incidence of acute myocardial infarction at approximately 62 per 100,000 person-years, with STEMI accounting for more than half of cases [6]. In contrast, Thailand, a middle-income country, has experienced a steady increase in ACS mortality, rising from 22.5 per 100,000 in 2011 to 35.1 in 2022 [7]. These trends illustrate both the heterogeneity of ACS epidemiology and the pressing need for region-specific evidence to guide prevention and management strategies.

The pathophysiology of ACS is primarily driven by rupture of an atherosclerotic plaque, platelet activation, thrombus formation, and subsequent coronary occlusion. ST-elevation myocardial infarction (STEMI) typically results from complete arterial obstruction, whereas non-ST-elevation myocardial infarction (NSTEMI) and unstable angina (UA) are more often associated with subtotal obstruction or an imbalance between myocardial oxygen supply and demand [1–3]. Beyond the acute phase, ACS is linked to substantial long-term morbidity and an increased risk of recurrent cardiovascular events [8,9]. Health-related quality of life (HRQOL) remains impaired for many survivors despite advances in treatment and secondary prevention [10]. In addition, ACS imposes a considerable economic burden, encompassing both direct healthcare expenditures and indirect productivity losses [11,12]. This burden is particularly pronounced in LMICs, where limited healthcare resources exacerbate the impact on patients, families, and health systems.

Risk factors for ACS are well established and include advanced age, smoking, hypertension, diabetes, dyslipidemia, obesity, male sex, sedentary lifestyle, and unhealthy diet [13,14]. More recently, environmental and meteorological conditions such as extreme temperatures, humidity, atmospheric pressure, and air pollution have been identified as contributors to seasonal variation in ACS incidence [15–18]. These emerging factors are particularly relevant in regions with marked climatic variation.

Thailand and Japan differ substantially in both socioeconomic and climatic contexts; however, comparative research on ACS between these countries remains scarce. To address this gap, this study aimed to compare ACS incidence and to identify demographic, clinical, and meteorological risk factors among ACS patients in Thailand and Japan. The novelty of this work lies in providing one of the first cross-country comparisons that integrates environmental factors, offering insights beyond single-country studies. The findings are expected to support the development of context-specific prevention

strategies and to strengthen healthcare planning in each population, with important public health implications for middle-income countries facing a rising ACS burden and for aging high-income societies managing complex comorbidities.

DESIGN AND SETTING

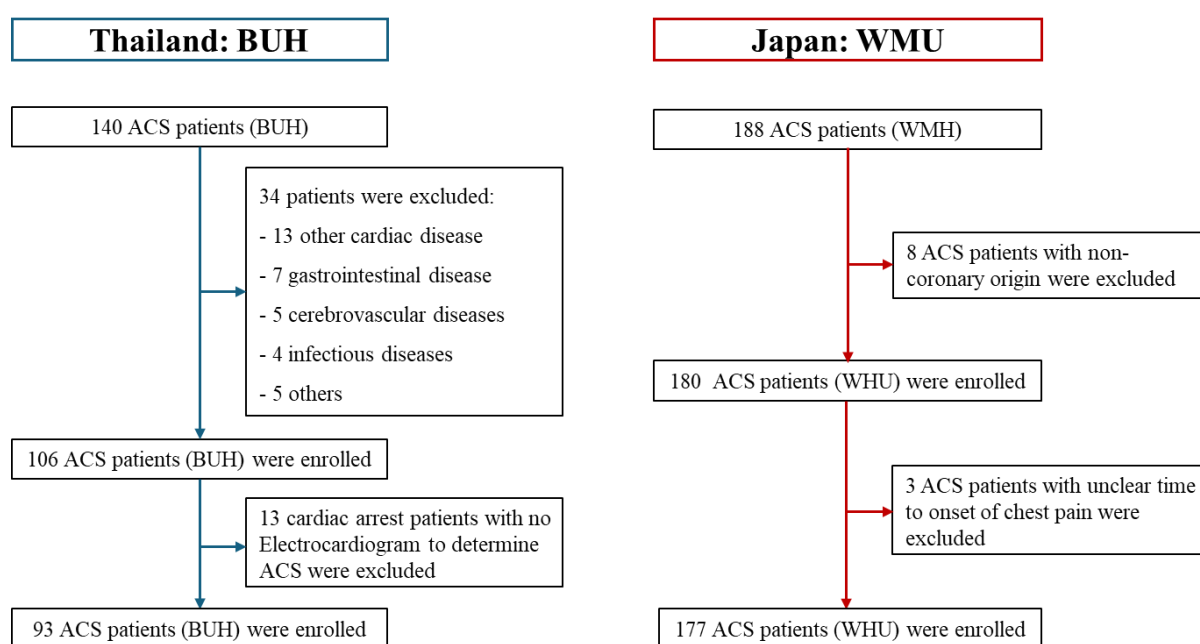
This collaborative retrospective cohort study was conducted in Japan and Thailand. Patients diagnosed with ACS were enrolled from the emergency departments of Wakayama Medical University (WMU), Japan, and Burapha University Hospital (BUH), Thailand, between January and December 2021. ACS was diagnosed according to international guidelines, based on a combination of typical clinical presentation (e.g., chest pain or equivalent ischemic symptoms), electrocardiographic (ECG) changes indicative of myocardial ischemia (such as ST-segment elevation or depression, T-wave inversion, or new left bundle branch block), and elevated cardiac biomarkers, particularly high-sensitivity troponins. Differentiation among STEMI, NSTEMI, and unstable angina was determined primarily by the presence or absence of persistent ST-segment elevation and elevated cardiac enzymes [19]. Data was obtained from electronic medical records.

STUDY POPULATION & SAMPLING

We conducted a collaborative retrospective cohort study of patients with ACS who presented to the emergency departments of WMU, Japan and BUH, Thailand between January and December 2021. We tried to identify the ACS onset time from chest pain based on medical records but excluded cases where the onset time was unknown due to a lack of chest pain or incomplete medical history in records. At WMU, 188 patients were initially identified; 11 were excluded (8 with non-coronary ACS and 3 with unknown onset time), leaving 177 eligible cases. At BUH, 140 patients were screened; 34 with non-ACS diagnoses and 13 with cardiac arrest in the emergency department were excluded, resulting in 93 eligible cases. Patient selection was conducted using a purposive sampling approach.

The Thai sample size was determined a priori using G*Power Version 3.1.9.2 for a point-biserial correlation, with a power of 0.90, an effect size of 0.30, and a significance level of 0.05 [20]. After adjusting for a 5% dropout rate, the required sample size was 93, and all 93 consecutive eligible patients were included. In contrast, the Japanese cohort comprised all eligible registry-confirmed cases ($n = 177$). The difference in sample size thus reflected the methodological design: the Thai cohort was based on pre-specified sample size estimation, whereas the Japanese cohort represented the entire registry population. Both cohorts exceeded the minimum requirement to ensure adequate statistical power, with the larger Japanese cohort further improving the precision of estimates. A patient enrollment flow diagram is presented in Figure 1.

FIGURE 1. PATIENT ENROLLMENT FLOW DIAGRAM OF ACS CASES AT WMU (JAPAN) AND BUH (THAILAND)



DATA COLLECTION

Data were obtained from electronic medical records and included demographic characteristics (age, sex, body mass index), clinical variables (blood pressure, heart rate, body temperature, Hypertension (systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure ≥ 80 mmHg), white blood cell count, hemoglobin, platelet count, creatinine kinase, and troponin T), ACS subtype, and 30-day mortality. Data abstraction was performed by trained medical staff who had undergone standardized training to ensure accuracy and reliability of data extraction. All data collectors were blinded to the study hypotheses. Interrater reliability was assessed by independent verification of a random sample of cases, with discrepancies resolved through consensus. Meteorological data (annual temperature, humidity, and atmospheric pressure) were retrieved from the national meteorological databases of Japan and Thailand.

ETHICAL CONSIDERATIONS:

The study protocol was approved by the ethics committees of Wakayama Medical University (No. 3780) and Burapha University (HS065). All procedures complied with the Declaration of Helsinki and Good Clinical Practice guidelines.

STATISTICAL ANALYSIS

Data were analyzed using JMP Pro version 16 (SAS Institute, Cary, NC, USA). Continuous variables are expressed as mean $\pm$ SD and compared using Student's t-test. Pearson's correlation coefficient was used to assess correlations. Categorical variables are presented as counts and percentages and compared using the Chi-square test or Fisher's exact test when the expected cell frequency was less than 5. Statistical significance was set at $p < 0.05$.

RESULTS

PART 1: DEMOGRAPHIC, CLINICAL, AND METEOROLOGICAL CHARACTERISTICS OF ACS PATIENTS AT WMU AND BUH

The demographic clinical and meteorological characteristics of ACS patients at WMU and BUH are summarized in Table 1. Patients at WMU were older (mean age 71.3 vs. 65.6 years) and more often male (80% vs. 62%) compared with BUH, and had a higher prevalence of comorbidities including hypertension, diabetes mellitus, and chronic kidney disease. In contrast, BUH patients had a higher body mass index (24.3 vs. 22.9). Blood pressure and heart rate on admission did not differ significantly between groups. Similarly, 30-day mortality following ACS onset showed no significant difference between groups. Average annual temperature, atmospheric pressure and humidity in 2021 also differed significantly between Thailand and Japan ($p < 0.001$). Regarding ACS subtypes (Table 2), STEMI was more frequent at WMU (66% vs. 24%), whereas NSTEMI predominated at BUH (62% vs. 27%).

TABLE 1. DEMOGRAPHIC, CLINICAL, AND METEOROLOGICAL CHARACTERISTICS OF ACS PATIENTS AT WMU AND BUH

Variables	BUH (n=93) Mean $\pm$ SD	WMU (n=177) Mean $\pm$ SD	P value
Age (years)	65.6 $\pm$ 14.0	71.3 $\pm$ 11.3	< 0.01
Male (%)	59 (62)	142 (80)	< 0.01
Body Mass Index (kg/m ²)	24.3 $\pm$ 4.3	22.9 $\pm$ 4.0	< 0.05
Systolic blood pressure at ER (mmHg)	136 $\pm$ 27	137 $\pm$ 35	.866
Diastolic blood pressure (mmHg)	80 $\pm$ 17	81 $\pm$ 21	.621
Heart rate at ER (beats/min)	91 $\pm$ 25	87 $\pm$ 24	.164
Body temperature at ER (°C)	36.5 $\pm$ 0.4	36.3 $\pm$ 0.7	< 0.01
White blood cell count	10,384 $\pm$ 4,187	9,218 $\pm$ 3,436	< 0.05
Hemoglobin (g/dL)	12.6 $\pm$ 2.5	13.3 $\pm$ 2.4	< 0.05
Platelet count (x10 ³ /μL)	265 $\pm$ 72	221 $\pm$ 76	< 0.001
Maximum creatinine kinase (normal value = 41-153 U/L)	-	1,653 $\pm$ 2,927	-

Variables	BUH (n=93) Mean±SD	WMU (n=177) Mean±SD	P value
Maximum troponin T (normal value ≤ 14 ng/L)	28.8±61.9	-	-
Hypertension (%)	42 (45)	146 (82)	< 0.01
Diabetes mellitus (%)	27 (29)	72 (40)	< 0.001
Chronic kidney disease (%)	6 (6)	50 (28)	< 0.001
Death within 30 days of ACS onset (%)	6 (6.5)	8 (4.5)	.497
Average annual temperature (°C)	29.4±1.8	17.4±7.6	< 0.001
Average annual atmospheric pressure (hPa)	1,008.9±2.6	1,013.5±6.5	< 0.001
Average annual humidity (%)	75.8±9.6	69.5±16.7	< 0.05

BUH = Burapha University Hospital, WMU = Wakayama Medical University, ACS = Acute coronary syndrome

TABLE 2. DISTRIBUTION OF ACS SUBTYPES IN PATIENTS AT WMU AND BUH

ACS categories	BUH (n=93)	WMU (n=177)	P value
STEMI (%)	22 (24)	117 (66)	< 0.001
NSTEMI (%)	58 (62)	47 (27)	< 0.001
UA (%)	13 (14)	13 (7)	< 0.001

BUH = Burapha University Hospital, WMU = Wakayama Medical University, ACS = Acute coronary syndrome, STEMI = ST-elevation myocardial infarction, NSTEMI = non-ST-elevation myocardial infarction, UA = unstable angina

PART 2: METEOROLOGICAL FACTORS ASSOCIATED WITH ACS ONSET AT BUH

The correlations among meteorological variables at the time of ACS onset in BUH are summarized in Table 3. Temperature and atmospheric pressure demonstrated a mild negative correlation ($r = -0.356$). Moderate negative correlations were observed between temperature and humidity ($r = -0.607$) and between atmospheric pressure and humidity ($r = -0.502$).

TABLE 3 PEARSON'S CORRELATION (R) OF METEOROLOGICAL VARIABLES IN ACS PATIENTS AT BUH

Variables	Correlation coefficient	P-value
T vs. P	-0.356	< 0.001
T vs. H	-0.607	< 0.001
P vs. H	-0.502	< 0.001

T = temperature, P = atmospheric pressure, H = humidity

DISCUSSION

This retrospective cohort study compared the incidence and risk factors of ACS in Thailand and Japan. No significant differences were observed in ACS onset time or 30-day mortality between the two countries, despite marked variations in patient characteristics. However, meteorological conditions, including temperature, atmospheric pressure, and humidity, differed substantially. These findings suggest that effective acute care systems in both countries may help mitigate short-term adverse outcomes following ACS, even under differing risk contexts.

Patient characteristics and ACS subtypes differed markedly between the two cohorts. Thai patients were younger and had higher body mass index (BMI), whereas Japanese patients were older with a greater prevalence of comorbidities including hypertension, diabetes, and chronic kidney disease. These demographic and clinical differences were reflected in the distribution of ACS subtypes: NSTEMI predominated in Thailand, while STEMI was more frequent in Japan. Obesity is increasingly recognized as a driver of premature coronary artery disease, particularly among younger adults, by promoting low-grade systemic inflammation, insulin resistance, and endothelial dysfunction [21-22]. These mechanisms may accelerate atherosclerosis progression and contribute to the higher proportion of NSTEMI in the Thai cohort. In

contrast, aging, vascular stiffness, and multimorbidity may predispose Japanese patients to STEMI, consistent with previous studies demonstrating higher STEMI rates among older populations with advanced atherosclerotic burden [6]. These cross-country differences underscore the importance of early lifestyle interventions to address obesity and metabolic risk factors in Thailand, while highlighting the need for comprehensive management of comorbidities in aging populations such as Japan.

Beyond clinical differences, our study identified significant variations in meteorological conditions. Average annual temperature, atmospheric pressure, and humidity differed substantially between Thailand and Japan. Within the Thai cohort, temperature showed mild to moderate negative correlations with both atmospheric pressure and humidity. Specifically, lower temperatures were associated with increased humidity and reduced atmospheric pressure, conditions that may intensify vascular stress and elevate ACS risk [23]. These findings are consistent with prior evidence linking ambient temperature extremes and pressure fluctuations with myocardial infarction [16-18]. Cold exposure can induce vasoconstriction, increase sympathetic activity, and elevate blood pressure, while reduced atmospheric pressure may impair oxygen delivery and promote hemodynamic instability. Meanwhile, high humidity can impair thermoregulation, placing additional stress on the cardiovascular system [23-26]. Although prior studies have typically examined these factors in isolation, our findings contribute novel evidence on the combined role of temperature, humidity, and pressure in ACS onset across different climate settings in Japan and Thailand. In addition to meteorological stressors, environmental pollution is a major public health concern in Thailand. Fine particulate matter (PM_{2.5}) and other pollutants are prevalent in urban and industrialized regions and may act synergistically with meteorological changes to increase ACS incidence. Short-term exposure to PM_{2.5} has been associated with increased hospitalizations for myocardial infarction through mechanisms involving systemic inflammation, endothelial dysfunction, and enhanced thrombogenicity [27-29]. The combined effects of cold weather with high pollution levels, or conversely hot weather with low humidity, may amplify oxidative stress and vascular instability, precipitating acute coronary events [23-25]. Although air pollution data were not directly measured in this study, the co-existence of meteorological extremes and air pollution in many tropical and urbanizing environments highlights an important contextual factor. Future research integrating high-resolution meteorological and air quality data could further clarify the synergistic impact of these exposures on ACS onset. This direction is particularly relevant in Southeast Asia, where rapid urbanization, seasonal weather shifts, and recurrent haze episodes compound cardiovascular risks [30].

The differences identified between Thailand and Japan have important implications for prevention strategies. In Thailand, where younger patients with higher BMI and NSTEMI predominate, prevention efforts should prioritize obesity reduction and lifestyle modification. Public health programs promoting healthy diet, regular physical activity, and early cardiovascular risk screening in young and middle-aged adults could help mitigate premature coronary disease. In Japan, where patients are older with more comorbidities and a higher proportion of STEMI, prevention should focus on comprehensive management of chronic conditions such as hypertension and diabetes, dietary salt reduction, and regular cardiovascular health assessments. In both contexts, public education campaigns and primary care engagement are critical to encourage early detection and sustained risk-factor control.

At a broader level, climate adaptation and environmental health policies may also reduce ACS burden. For Thailand, strengthening air pollution control and urban planning to mitigate PM_{2.5} exposure could be integrated into cardiovascular prevention frameworks. For Japan, public health strategies may need to adapt to the cardiovascular risks of an aging society in a temperate climate with substantial seasonal variation. These tailored approaches highlight the importance of integrating clinical, environmental, and demographic perspectives in designing cardiovascular disease prevention strategies.

The main strength of this study is that it is among the first to compare ACS characteristics between Japan and Thailand while integrating meteorological perspectives, thereby offering novel context-specific insights. However, important limitations should be acknowledged, including its retrospective, single-center design with modest sample sizes, reliance on regional rather than individual meteorological data, and the absence of air pollution measures such as PM_{2.5}, which may restrict the generalizability of the findings. Future multicenter prospective studies with larger cohorts, high-resolution

environmental and pollution data, and longer follow-up are warranted to better elucidate the combined effects of meteorological and pollution exposures on ACS risk.

CONCLUSION

This study found no significant difference in ACS onset time between Thailand and Japan but revealed marked cross-country differences in demographic, clinical, and environmental profiles. Younger Thai patients with higher BMI more frequently presented with NSTEMI, whereas older Japanese patients with multiple comorbidities had a greater proportion of STEMI. Meteorological factors, particularly temperature, atmospheric pressure and humidity, were significantly associated with ACS onset in Thailand. These findings emphasize the need for tailored prevention strategies in each setting and underscore the importance of future research integrating clinical, meteorological, and environmental data to strengthen cardiovascular disease prevention in the context of climate change.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the Faculty of Nursing, Burapha University, Thailand, for the research funding and the research team from Wakayama Medical University, Wakayama, Japan, and Burapha University Hospital, Chonburi, Thailand, for their valuable contributions.

CONFLICTS OF INTEREST:

The authors declare that there is no conflict of interest.

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DIFFERENCES IN PERSON-CENTRED CARE BETWEEN PUBLIC AND PRIVATE HOSPITALS IN MONGOLIA

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ABSTRACT

Healthcare management plays a critical role in improving clinical outcomes. Globally, there has been an increasing focus on person-centred care as a means to enhance healthcare management. In Mongolia, although person-centered care is reflected in health sector policy documents and accreditation standards, the associated health outcome indicators remain insufficiently comprehensive. Therefore, this study was designed to assess person-centred care in hospitals and to compare the differences between public and private hospitals.

The study involved physicians, healthcare workers, and patients from three public hospitals and three private hospitals. A cross-sectional study design was employed, using the Person-Centred Climate Questionnaire to assess perceptions of person-centred care. Key factors were identified through principal component analysis. Differences between public and private hospitals were analyzed using a one-way ANOVA test. The reliability and validity of the questionnaire were assessed using Cronbach's alpha, and sample adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) test.

Patients in both public and private hospitals rated person-centred care based on two factors: the climate of safety and the climate of everydayness. Physicians and healthcare workers in public hospitals also assessed person-centred care using these two factors, whereas those in private hospitals identified only one factor. The climate of hospitality—a key dimension of person-centred care—was not measured in any of the surveyed hospitals. Patients in public hospitals rated person-centred care more highly than those in private hospitals. However, physicians and healthcare workers gave higher ratings to private hospitals compared to public hospitals.

KEYWORDS

person-centred care, healthcare management

INTRODUCTION

Person-centred care is grounded in the values of respect for individuals, the right to self-expression, mutual respect, and understanding—principles shaped and influenced by cultural context [1]. David Edvardsson et al. (2008) defined person-centred care as focusing on caring, personalizing the environment, shared decision-making, interpreting symptoms and behaviors from the person's perspective, and prioritizing communication over care [2]. It considers the whole precondition and the patient's health condition and empowers the individual to play an active role in the healthcare process [3]. It serves as the foundation for delivering safe, high-quality healthcare, contributing to improved outcomes and experiences for patients, caregivers, and families [4].

A theoretical framework of person-centred care refers to the concept of humane care with a moral component, and this practice is described as a relationship based on effective interpersonal processes aimed at achieving therapeutic goals. The following principles are recognized as the foundation of a person-centred approach: treating people as individuals, respecting their rights as a person, building mutual trust and understanding and developing positive relationships [5]. This philosophical position reflects models for developing person-centred care that place the humanity of individuals at the core of care. While person-centred care is increasingly central to healthcare, theoretical development has often focused on related concepts and theories, particularly relationship-centred care, compassionate care, and dignified care. However, none of these theories fully endorses a holistic view of person-centred care as a unified theory of how all individuals—healthcare professionals, patients, families, and communities—experience healthcare [5].

There are several models of person-centred care, all of which are described as 'placing the person at the center of care' [6]:

- The authentic consciousness model (McCormack 2003) [6]
- The tidal model (Barker 2000) [6]
- Skilled companionship (Tichen 2001) [6]
- The senses framework (Nolan et al. 2004) [6]
- Dementia reconsidered (Kitwood 1997) [6]
- VIPS (Brooker 2007) [6]
- The Burford model (Johns 1994) [6]

The Person-Centred Practice Framework was developed to support the implementation of person-centred practices and to provide clinicians with a shared language to identify the components of person-centredness, along with the barriers and enablers that influence its development in the workplace [5]. This framework, developed by Tanya McCance and her colleagues over more than a decade, originated in the nursing field but has since been adopted more broadly across healthcare systems. The Person-Centred Practice Framework comprises four core domains, with a fifth domain currently being developed as an additional component.

1. Prerequisites. It focuses on the attributes and qualities of healthcare staff.
2. Practice environment. This reflects the complexity inherent in the healthcare delivery context.
3. Person-centred processes. It emphasizes participatory methods that foster meaningful connections between people.
4. A healthful culture. The result of developing effective person-centred practices is a healthy culture that promotes human flourishing.
5. Macro context. This framework provides a macro-level context that reflects the strategic and political factors influencing the development of person-centred cultures.

Widely recognized as the gold standard in healthcare delivery [7], person-centred care has become a guiding principle for health systems globally [8]. The concept has also evolved beyond a narrow focus on patients, encompassing a broader approach that includes relationships, communication, and systemic responsiveness. For example, in 2001, the Institute of Medicine included 'patient-centred care' as one of the six goals of twenty-first century healthcare system in 'Crossing the

quality chasm' [25]. The World Health Organization has developed 'Global strategy on integrated people-centered health services 2016-2026' [9] and in order to improve healthcare services the Tokyo Declaration on Patient Safety was adopted in 2018, and it was decided to make September 17 of each year 'World Patient Safety Day'. Such as all of this indicates a global focus on person-centred care.

In Mongolia, the long-term development policy 'Vision-2050' [10] set the goal of providing quality, comprehensive healthcare services that meet the population's needs. In addition, the 'Action Plan for 2022-2025 to Improve the Quality and Safety of Healthcare Services' [11] emphasizes person-centred care by including the development of such services. Furthermore, the criteria for accrediting healthcare providers [12] require the inclusion of a person-centred service evaluation group. Collectively, these documents demonstrate that Mongolia's health sector is focusing on delivering person-centered care.

Person-centred care in hospitals has demonstrated positive impacts on the healthcare sector, including increased patient satisfaction, reduced emergency room wait times, fewer medication errors, and lower mortality rates [8]. The quality of healthcare can be measured using outcome indicators, and person-centred care as the foundation for delivering high-quality health care. But the incidence of diseases in Mongolia increased 1.68 times, from 2,262.7 cases per 1,000 population in 2014 to 3,808.8 in 2023 [13]. The average incidence over the past 10 years has been 2,930.3 per 100,000 population. In 2014, the national death count was 16,495, of which 21.6 percent occurred in hospitals. In 2023, hospital deaths accounted for 4,127 out of 17,533 total deaths, indicating that this proportion has not decreased. However, the percentage of hospital deaths that underwent pathological autopsy has declined over the past 10 years, from 68.1 percent to 43.8 percent (1,807 cases). However, the discrepancy in primary diagnoses identified through this analysis increased from 5.7 percent in 2014 to 11 percent [14], suggesting that current health outcome indicators remain insufficient. Compared to some East Asian countries, Mongolia's under-five and perinatal mortality rates per 1,000 live births are among the highest.

The low level of satisfaction among physicians and healthcare workers contributes to poor patient satisfaction [15]. Furthermore, the current quality and availability of healthcare services do not meet citizens' expectations, resulting in low satisfaction with the quality of care [16].

Researchers have noted that well-managed hospitals achieve better clinical outcomes and that effective management plays a crucial role in ensuring patient well-being [17]. Therefore, we conducted this study based on the belief that assessing the current state of person-centred care in Mongolian tertiary public and private hospitals is essential, and that the findings will play an important role in supporting future improvements in hospital management.

METHODS

HYPOTHESIS

People-centred care in both public and private hospitals is determined by three factors: safety, daily routine, and hospitality. However, there are notable differences in how these factors are implemented in public and private hospitals.

SAMPLING OF STUDY

This study utilized a cross-sectional study, examining three public hospitals and three private hospitals that offer tertiary healthcare services. The study covered 314 patients, 289 physicians and health workers from public hospitals, and 202 patients, 237 physicians and health workers from private hospitals.

Mongolian Health Law defines 14 types of organizations that provide healthcare services [26]. This research focused on a specialized hospital that offers nationwide referral healthcare services. Currently, nine state-owned specialized hospitals operate under the Ministry of Health. From these hospitals, three comparable hospitals that provided similar care were selected; after obtaining permission from their managers to participate in the study, data were collected.

As of 2023, there are 239 private hospitals operating across the country, with 69.2 percent (165 hospitals) located in Ulaanbaatar [13]. Within Ulaanbaatar, there are 32 private hospitals with 50 or more beds, and 8 hospitals with more than 89 beds. Of these eight hospitals, five were invited to participate in the study, and three agreed to take part. The sample consisted of all physicians and healthcare workers employed at the three public hospitals and three private hospitals that agreed to participate in the study, with a confidence interval of 95%. Respondents were selected randomly.

RESEARCH QUESTIONNAIRE

The Person-Centred Climate Questionnaire (PCQ) was developed in 2008 by David Edvardsson et al. The patient version (PCQ-S) includes three subscales: a climate of safety, a climate of everydayness, and a climate of hospitality, comprising 17 questions [6]. The staff version of the Person-Centred Climate Questionnaire consists of three subscales: a climate of safety, a climate of everydayness, and a climate of community, with 14 questions [18, 7]. This questionnaire is rated on a 6-point Likert scale.

In the patient version of the questionnaire, the 'climate of safety' subscale includes items related to the knowledge and education of physicians and health workers, their friendliness, the reliability of care, the safety of the hospital environment, and the opportunity for patients to communicate with healthcare providers. The 'climate of everydayness' reflects how comfortable the hospital stay feels—similar to being at home—as well as the ability to engage in simple conversations and maintain a positive atmosphere. The 'hospitality' subscale assesses the dedication of staff toward patients, the opportunity for patients to make their own choices, and the perceived advantages the hospital offers over others.

TABLE 1. QUESTIONS OF THE PERSON-CENTRED CLIMATE QUESTIONNAIRE, CATEGORIZED BY EACH FACTOR

Factors	Patient Version	Staff Version
A climate of safety	1,2,3,4,5,6,7,8,9,10	1,2,3,4,5
A climate of everydayness	11,12,13,14	6,7,8,9,10
A climate of hospitality/community	15,16,17	11,12,13,14

Source: [6, 18]

The 'climate of safety' in the staff version of the questionnaire is measured by the reliability and security of the care environment, the clarity with which patients can express themselves, the availability of personal space in the workplace, and the overall friendly and warm atmosphere. The 'climate of everydayness' reflects how peaceful and homelike the work environment feels. It includes the ability to see the positive aspects of the workplace, maintain focus, and work in an orderly setting. The 'climate of community' is assessed by the amount of time patients have to meet and speak with visitors, as well as the opportunities they have to communicate with physicians, healthcare workers, or other staff members.

ETHICAL APPROVAL

The University of Finance and Economics requested permission to conduct the study from three public hospitals (letter No. 4/420, 2021) and from three private hospitals (letters No. 4/645, 4/646, and 4/647, 2021). With the approval of the hospital administrators and the medical ethics committee, a questionnaire survey was conducted among patients and staff of the respective hospitals. The survey did not request the names of patients or staff, and their identities could not be determined.

VALIDITY AND RELIABILITY

The Person-Centred Climate Questionnaire was originally developed in Swedish and has not been translated into Mongolian, so it was translated from the English version with the author's permission. The translation was done using the forward-backward method (English-Mongolian and Mongolian-English) and reviewed by two different professional translators. The Mongolian-translated version of the questionnaire was also completed and tested by physicians, nurses, and health workers. During the test, brief conversations were held with participants to assess the clarity of the questionnaire and whether the basic content of the questions—rooted in cultural differences—was understood. The reliability of the questionnaire was tested by calculating Cronbach's α coefficient.

STATISTICAL ANALYSIS

IBM SPSS (version 25.0) was used to analyze the survey data. The means and standard deviations of each subscale of the questionnaire were calculated, along with the observed values at a 95% confidence interval. The Kaiser-Meyer-Olkin (KMO) test was used to assess sampling adequacy. The internal consistency of the Person-centred Climate Questionnaire was evaluated using Cronbach's alpha coefficient, and the factor structure was examined through Principal Component Analysis (PCA). All statistical analyses were considered significant at $p < 0.05$.

In our study, we selected two groups of public and private hospitals to evaluate person-centred care. Hospitals are divided into two groups – public and private – based on their form of ownership. Patients and healthcare workers from both groups were included, allowing us to assess person-centred care from two perspectives. To determine whether patients and staff evaluate person-centred care differently based on the type of hospital, we conducted a one-way ANOVA test. In addition, demographic characteristics of patients such as age, gender, are of residence, frequency of hospitalization, days spent, and education were considered for both groups. It was also necessary to analyze whether the demographic characteristics of healthcare workers differed in terms of age, gender, education level, job position, department, and years of healthcare institution. Therefore, since one-way analysis of variance is used to determine whether group means differ across demographic variables, we employed the One-Way ANOVA with Post-hoc Tukey test for this analysis.

RESULTS

The average age of patients in public hospitals was 48.5 years, with 56.4% being female. In private hospitals, the average age was 38.7 years, and 53.0% were female.

Regarding education, 36.9% of public hospital patients completed secondary education, while 48.5% of private hospital patients held a bachelor's degree. Among public hospital patients, 69.1% were residents of Ulaanbaatar (UB), and 62.1% were hospitalized for the first time. In private hospitals, 77.7% of patients were UB residents, and 66.3% were first-time inpatients (Table 2).

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

Variables	Total participants (n, %)		Mean $\pm$ SD	
	Public hospital	Private hospital	Public hospital	Private hospital
Gender				
male	137 (43.6%)	89 (44.0%)	-	-
female	177 (56.4%)	107 (53.0%)	-	-
Age (year)			48.5 $\pm$ 16.0	38.7 $\pm$ 11.8
Education level				
secondary school	116 (36.9%)	19 (9.4%)	-	-
middle school	52 (16.6%)	45 (22.3%)	-	-
bachelors	107 (34.1%)	98 (48.5%)	-	-
masters	30 (9.6%)	26 (12.9%)	-	-
PhD	3 (1.0%)	3 (1.5%)	-	-
Are of residency				
Ulaanbaatar city	217 (69.1%)	157 (77.7%)	-	-
rural	96 (30.6%)	40 (19.8%)	-	-
Frequency of hospitalization				
first time	195 (62.1%)	134 (66.3%)	-	-
2 or more	107 (34.1%)	52 (25.7%)	-	-
Days spent			4.9 $\pm$ 3.6	5.1 $\pm$ 2.5

The average age of physicians and health workers in public hospitals was 33 years, with 77.9% being female. In private hospitals, the average age was 33.8 years, with 75.5% female.

Regarding education, 64.4% of physicians and health workers in public hospitals held a bachelor's degree, while 62.0% in private hospitals had the same level of education.

The average years of experience among physicians and health workers in public hospitals was 9.1 years, with 6.9 years of professional experience. In private hospitals, the average was 8.9 years, with 6.0 years in the profession (Table 3).

TABLE 3. DEMOGRAPHIC AND PROFESSIONAL CHARACTERISTICS OF THE PHYSICIANS AND HEALTH WORKERS

Variables	Total participants (n, %)		Mean $\pm$ SD	
	Public hospital	Private hospital	Public hospital	Private hospital
Gender				
male	62 (21.5%)	51 (21.5%)	-	-
female	225 (77.9%)	179 (75.5%)	-	-
Age (year)			33.0 $\pm$ 9.4	33.8 $\pm$ 9.5
Education level				
professional diploma	39 (13.5%)	42 (17.7%)	-	-
bachelors	186 (64.4%)	147 (62.0%)	-	-
masters	42 (14.5%)	29 (12.2%)	-	-
PhD	1 (0.3%)	2 (0.8%)	-	-
Total work experiences (year)			9.1 $\pm$ 9.5	8.9 $\pm$ 8.6
Current work experience (year)			6.9 $\pm$ 8.2	6.0 $\pm$ 7.1

In the person-centred care assessment of patients in the inpatient wards of public hospitals, two factors were identified through Principal Component Analysis (Tables 4 and 6).

TABLE 4. FACTOR LOADING MATRIX FOR EACH ITEM OF THE PCQ-PATIENT VERSION (PUBLIC HOSPITALS)

No	Items	Factor 1. A climate of safety	Factor 2. A climate of everydayness	Factor 1. A climate of hospitality
P4	A place where I feel welcome	0.830		-
P5	A place where it is easy to talk to the staff	0.829		-
	A place where I rely on receiving the best care	0.812		-
P7	A place where the staff come quickly when I need help	0.688		-
P3	A place where I feel in safe hands	0.651		-
P1	A place where the staff is knowledgeable	0.645		-
P10	A place where the staff have time for the residents	0.628		-
P8	A place where the staff use language, I can understand	0.568		-
P6	A place where the staff take notice of what I say	0.546		-

P9	A place which is neat and clean	0.534	-
P17	A place where I can get "that little bit extra"	0.782	-
P13	A place where it is possible to get unpleasant thought out of your head	0.768	-
P12	A place where which feels homely even though I am in an institution	0.761	-
P14	A place where people talk about ordinary things, not just illness	0.735	-
P11	A place where there is something nice to look at	0.730	-
P16	A place where I can make choices, for example what to wear	0.677	-
P15	A place where the staff make extra efforts on my behalf	0.650	-
Cronbach's Alpha		0.932	
KMO test		0.924	

Patients defined person-centred care as a climate of safety, a climate of everydayness, and a climate of safety is 0.534-0.830 and a climate of everydayness is 0.650-0.782. Table 5 shows the results of the principal component analysis of the assessment of the person-centered care in public hospitals' physicians and health workers.

TABLE 5. FACTOR LOADING MATRIX FOR EACH ITEM PCQ-STAFF VERSION (PUBLIC HOSPITALS)

No	Items	Factor 1. A climate of safety	Factor 2. A climate of everydayness	Factor 1. A climate of community
S1	A place where I feel welcome	0.784		-
S2	A place where I feel acknowledged as a person	0.782		-
S5	A place where the staff use a language that the patients can understand	0.762		-
S3	A place where I feel I can be myself	0.761		-
S4	A place where the patients are in safe hands	0.648		-
S12	A place where it is easy for the patients to receive visitors		0.817	-
S14	A place where the patients have someone to talk to if they so wish		0.779	-
S13	A place where it is easy for the patients to talk to the staff		0.771	-
S8	A place where it is quiet and peaceful		0.769	-
S11	A place where it is easy for the patients to keep in contact with their loved ones		0.738	-
S9	A place where it is possible to get unpleasant thoughts out of your head		0.673	-
S7	A place where there is something nice to look at		0.641	-
S10	A place which is neat and clean		0.618	-
S6	A place which feels homely even though it is in an institution		0.597	-

Cronbach's Alpha	0.937
KMO test	0.932

Physicians and health workers defined the person-centred care in public hospitals using two factors: a climate of safety (0.648-0.784) and a climate of everydayness (0.597-0.817).

TABLE 6. FACTOR LOADING MATRIX FOR EACH ITEM OF THE PCQ-PATIENT AND STAFF VERSION (PRIVATE HOSPITALS)

	Patients	Physicians and health workers
A climate of safety	0.670-0.853	0.493-0.877
A climate of everydayness	0.608-0.835	
A climate of hospitality/ community	-	
Cronbach's Alpha	0.968	0.954
KMO test	0.958	0.945

Patients in private hospitals defined person-centred care in terms of a climate of safety and everydayness, while physicians and health workers defined person-centred care as a single factor (Table 6).

Table 7 shows the average scores for each of the factors determining person-centred care for patients in public and private hospitals, as well as for physicians and health workers working in these hospitals.

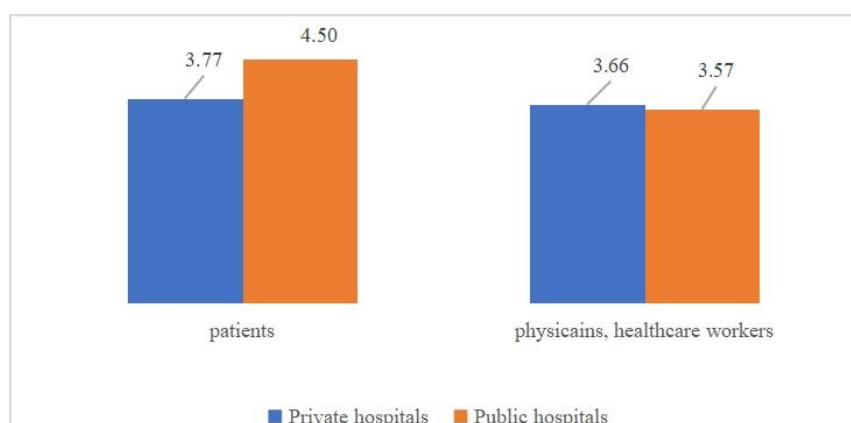
TABLE 7. MEAN VALUES FOR EACH FACTOR (PUBLIC AND PRIVATE HOSPITALS)

	Patients (SD)		Physicians and health workers (SD)	
	Public hospital	Private hospital	Public hospital	Private hospital
A climate of safety	4.60 (0.82)	3.95 (0.99)	3.31 (1.43)	3.66 (1.16)
A climate of everydayness	4.33 (1.14)	3.63 (1.23)	4.01 (1.11)	
A climate of hospitality/ community	-	-	-	

The difference between the mean values of public and private hospitals for assessing the climate of everydayness is 0.7, and the difference for the climate of safety is 0.65.

Figure 1 compares the mean values of the person-centred care assessments by patients, physicians and health workers in public and private hospitals.

FIGURE 1. MEAN VALUE OF THE PERSON-CENTRED CARE ASSESSMENT



Patients in public hospitals rated the hospital's person-centred care higher than those in private hospitals (0.73). However, physicians and health workers in public hospitals rated person-centred care lower than their counterparts in private hospitals (0.09).

TABLE 8. RESULT OF ONE-WAY ANOVA TEST, PATIENTS

N ^o	Variables	Person-centred care (Sig.)	P value
1	Type of hospital	0.000*	< 0.05
2	Age	0.000*	< 0.05
3	Gender	0.502	> 0.05
4	Residential address	0.152	> 0.05
5	Hospital stay recurrence	1.000	> 0.05
6	Days in hospital	0.382	> 0.05
7	Education level	0.455	> 0.05

Patients indicated that there were differences in the level of person-centred care provided by public and private hospitals, which was statistically significant. Patients also assessed person-centred care differently depending on age group.

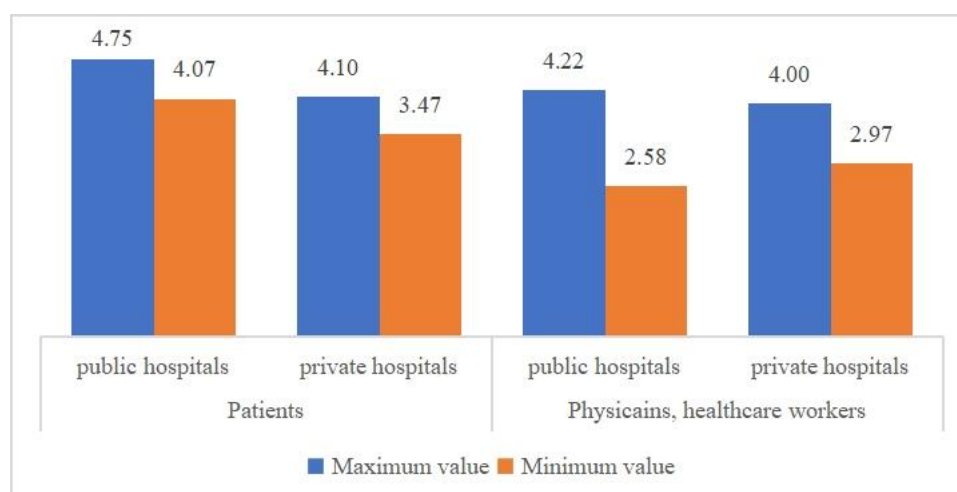
TABLE 9. RESULT OF ONE-WAY ANOVA TEST, STAFF

N ^o	Variables	Person-centred care (Sig.)	P value
1	Type of hospital	0.040*	< 0.05
2	Group of age	0.152	> 0.05
3	Gender	0.982	> 0.05
4	Occupation, position	0.000*	< 0.05
5	Years of work in the now position, by group	0.669	> 0.05
6	Department	0.041*	< 0.05
7	Education level	0.007*	< 0.05

Physicians and health workers believe that person-centred care varies depending on the type of hospital ($p=0.040 < 0.05$). Physicians and health workers evaluate person-centred care differently depending on their position, department, and education level.

Figure 2 compares the maximum and minimum values of person-centred care assessments by patients in public and private hospitals, as well as by physicians and health workers working in these hospitals.

FIGURE 2. COMPARISON OF MAXIMUM AND MINIMUM VALUE



Patients in public hospitals rated person-centred care higher than those in private hospitals. The difference in the highest score was 0.65 (public: 4.75, private: 4.10), and the difference in the lowest score was 0.6 (public: 4.07, private: 3.47).

TABLE 10. COMPARISON OF MAXIMUM AND MINIMUM VALUES OF PERSON-CENTRED CARE RATINGS

	Patients		Physicians and health workers	
	Public hospital	Private hospital	Public hospital	Private hospital
Maximum score value	P2. A place where I rely on receiving the best care (4.75)	P9. A place which is neat and clean (4.10)	S5. A place where the staff use a language that the patients can understand (4.22)	S1. A place where I feel welcome (4.00)
Minimum score value	P12. A place where which feels homely even though I am in an institution (4.07)	P14. A place where people talk about ordinary things, not just illness (3.47)	S12. A place where it is easy for the patients to receive visitors (2.58)	S12. A place where it is easy for the patients to receive visitors (2.97)

Patients in public hospitals rated the hospital's 'reliable and best' healthcare the highest (4.75), while patients in private hospitals rated it as 'neat and clean' (4.10). Patients admitted to private hospitals rated the 'opportunity to talk about simple things, not diseases' in a hospital setting as the lowest (3.47), whereas patients in public hospitals rated the 'hospital environment' as the lowest (4.07).

Physicians and health workers working in public hospitals rated 'speaking words and phrases that are understandable to their patients' the highest (4.22), while physicians and health workers in private hospitals rated 'friendliness' the highest (4.00).

Patients, and physicians, health workers in both public and private hospitals rated 'free spaces for patients to meet their visitors' the lowest, with scores of 2.58 and 2.97, respectively.

DISCUSSION

According to international surveys, patients typically define person-centred care in hospitals based on three subscales: a climate of safety, a climate of everydayness, and a climate of hospitality [7, 8]. Similarly, health workers define person-centred care using three subscales: a climate of safety, a climate of everydayness, and a climate of community [7, 19]. However, a study conducted by Korean and Swedish researchers found that health workers identified person-centred care using four subscales, with an additional dimension called the "climate of comprehensibility" [20, 21].

In this survey, person-centred care in public hospitals was defined by both patients and physicians/health workers using two subscales: a climate of safety and a climate of everydayness. The third subscale—a climate of hospitality (for patients) or a climate of community (for physicians and health workers)—was not measured.

Hospitality refers to the manner in which hosts receive, welcome, and interact with guests [22]. In healthcare settings, a hospitality-centered philosophy aims to enhance patient satisfaction and emotional well-being through genuine acceptance, fulfillment of needs, and effective problem-solving during interactions between patients and providers [23]. Hospitals are expected to offer patients a warm welcome and farewell, as well as a comfortable environment that fosters care, communication, and support.

The results of this study suggest that in the current Mongolian context, patients tend to prioritize the treatment of their illnesses while overlooking the importance of service quality and hospitality. On the other hand, healthcare in hospital

settings is still characterized by provider-centricity. In other words, patients tend to follow and implement the instructions of physicians and healthcare workers without question. Recently, researchers have suggested that shifting from a provider-centric approach to a person-centred care is more appropriate and mutually beneficial for both patients and providers. Our study did not measure the hospitality climate in either public and private hospitals, which suggests that the Mongolian healthcare sector continues to deliver predominantly provider-centred care. This phenomenon can be better understood in the context of Mongolia's healthcare system. Until 1990, Mongolia had a centrally planned economy, and its healthcare sector followed the Semashko model, which was widely used in such economies.

The Semashko model, developed by Soviet People's commissar for healthcare Nikolai Semashko, is based on the principle that the state is responsible for ensuring the health of all citizens by providing free and high-quality healthcare services. This model reflects the centralized planning approach of the state [24]. Therefore, the results of our study suggest that although Mongolia has transitioned to a market economy, its healthcare sector has not yet undergone a full transition.

According to a study by Chinese researchers, health workers rated person-centred care higher than patients [7]. The difference in mean values for the climate of safety was 1.30, for the climate of everydayness was 0.30, and for the climate of hospitality/community was 2.72. However, in this study, physicians and health workers rated person-centred care lower than patients. The difference in mean values for the climate of safety was 1.29, and for the climate of everydayness was 0.32.

Our study found that person-centred care was rated more highly by patients than by staff, which contrasts with the findings of Chinese researchers. However, the focus of the two studies differs. The Chinese study was conducted in a nursing home setting, while our research was carried out in hospitals providing clinical care. Furthermore, differences in socio-economic status, health systems, health outcome indicators, and demographic characteristics between the two countries may also contribute to the variation in findings. These factors should be examined and explained in more detail in future studies. In this study, physicians and health workers rated person-centred care lower than their patients, which contrasts with findings from studies in other countries. However, the difference between the mean values for the climate of safety and the climate of everydayness was at a similar level.

Public hospital patients rated person-centred care higher than patients in private hospitals, suggesting greater confidence in the reliability and safety of public healthcare. In our study, private hospital physicians and healthcare workers identified person-centred care as one factor, which may be related to the fact that worker member performs multiple functions. The public and private hospitals included in the survey offer a similar range of healthcare services but differ in terms of the number of beds, patients, and staff. The number of medical professionals, such as doctors and nurses, is adjusted based on patient volume and demand. However, it cannot be overlooked that physicians and nurses also perform support functions beyond the provision of direct medical care.

The greatest strength of public hospitals lies in their ability to provide reliable, safe, and quality healthcare to patients—an aspect also recognized by healthcare providers themselves. For patients of private hospitals, the highest value is placed on the hospital's cleanliness, orderliness, and environment, while staff members appreciate the warm and comfortable working conditions. The aspects of person-centred care that received the highest ratings are expected to continue performing at this level.

Patients and physicians, healthcare workers should take action to improve person-centred care by focusing on the aspects that received the lowest ratings. For instance, physicians, healthcare workers in both public and private hospitals highlighted the need to enhance the hospital environment and the climate of hospitality. It is also recommended to improve the climate of everydayness by helping patients feel more at home and engaging in simple, non-medical conversations.

CONCLUSION

The Person-Centred Climate Questionnaire is designed to be defined by three sub-scales: a climate of safety, a climate of everydayness and a climate of hospitality/community. We hypothesized in our study that it would be measured by the above three factors, but the Principal Component Analysis found that it was measured by two factors. Both the service provider and the service recipient reported that there was no climate of hospitality person-centred care in the hospital environment.

The second hypothesis, that person-centred care differs depending on the type of hospital, was confirmed by a One-way ANOVA analysis. People-centred care is valued differently by patients depending on their age group, and by physicians and health workers depending on their education, position, and department.

Person-centred care in public hospitals was defined by participants using two factors. Similarly, patients in private hospitals identified two factors, while physicians and health workers in private hospitals identified only one. These findings suggest that the climate of hospitality and community is not functioning effectively, indicating a need for greater attention from healthcare providers. Furthermore, it is essential to focus on the lowest-scoring areas and implement measures to improve them.

Future researchers in this field should consider using qualitative research methods, such as interviews, to explore individuals' perceptions and cultural patterns, and to better understand the underlying causes. As this is the first known study evaluating person-centred care in hospitals has not been conducted previously in Mongolia, making it the first to contribute to the improvement of hospital management. Therefore, further research is needed to re-confirm the validity and reliability of the Person-Centred Climate Questionnaire. It is also recommended to include samples from various types of healthcare providers or to conduct an expanded study that incorporates provincial and local hospitals.

LIMITATIONS

This study included only major tertiary public and private hospitals operating in UB. A limitation of the study is that it did not include or compare aimag (provincial or regional hospital) or secondary-level hospitals, which are more geographically dispersed and serve populations with lower density. The sample was selected from tertiary hospitals that provide similar types of care and services, allowing for comparability. However, while obtaining informed consent is ethically appropriate, selecting hospitals based on their willingness to participate may have introduced selection bias. Another limitation is the exclusive use of quantitative research methods.

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LEADERSHIP STYLES AND ITS OUTCOME IN MONGOLIAN HOSPITALS

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ABSTRACT

BACKGROUNDS:

Leadership plays an important role enhancing performance, employee and patient satisfaction, and clinical outcomes. Previous studies done in other countries showed that transformational leadership was generally considered the most effective style across various contexts.

AIM:

This study investigates differences in clinical leadership styles between rural and urban public hospitals in Mongolia, comparing these against international benchmarks to identify insights for policy and administrative improvement.

Material and methods:

METHODS:

This study was conducted using quantitative method, multicentre cross-sectional design, sampling 1,458 healthcare professionals from 12 sites across Mongolia, including both urban and rural regions. Stratified random sampling ensured diverse geographical representation. The MLQ-5X questionnaire was used to assess leadership styles and outcomes after validating the tool's reliability in Mongolian version by principal component analysis. The score of leadership style and outcome were compared with European Reference Score (ERS) using one sample T-test.

RESULTS:

Compared with ERS, Mongolian hospital managers employed significantly lower transformational and transactional leadership styles. Passive-avoidant leadership style was significantly more prevalent compared with ERS in both settings ($p < 0.001$). Leadership outcome scores of heads of departments and directors of hospitals were lower than ERS.

There was no statistical difference between rural and urban ratings of transformational leadership. Passive/avoidant leadership was rated slightly lower in rural areas. All components of transformational leadership were strongly and positively correlated with leadership outcomes such as Extra Effort, Effectiveness, and Satisfaction, with correlation coefficients ranging from $r = 0.684$ to 0.876 ($p < 0.01$). Leadership outcomes such as effectiveness, satisfaction, and extra effort were perceived similarly across both settings, indicating broadly consistent leadership practices across geographic regions.

CONCLUSIONS:

Passive-avoidant leadership style is the dominant approach among both settings. Contrary to expectations, leadership style perceptions did not significantly differ between rural and urban healthcare settings in Mongolia. This suggests a relatively uniform leadership culture within the public health sector. Policymakers and administrators in Mongolia should enhance leadership training oriented to transformational and transactional styles to improve performance across diverse healthcare environments.

KEYWORDS

Healthcare administrator, Leadership style, Leadership outcome, Head of department, Director of hospital, European Reference Score

INTRODUCTION

Leadership plays an important role in enhancing performance, improving employee and patient satisfaction, and clinical outcomes. Previous studies done in other countries showed that transformational leadership is generally considered the most effective style across various contexts. Our study investigated leadership styles and their outcome in Mongolian public hospitals [1,2].

The impact of leadership styles may vary across regions due to distinct local challenges and cultural contexts [3]. Barbara Kellerman (2012) discusses that while the core principles of leadership may remain consistent, the application of these principles can differ across geographic and cultural boundaries. Therefore, it is important to acknowledge regional differences in leadership practices and outcomes whilst examining their effects on healthcare systems globally.

Worldwide, healthcare systems face a multitude of challenges, many of which vary significantly across different regions [3]. For instance, healthcare models in urban environments often differ drastically from those in rural settings, particularly in terms of access, infrastructure, and resource distribution. The study of healthcare models and leadership in rural environments remains an underexplored area in academic literature, with few studies offering in-depth insights into the unique challenges faced by rural healthcare organizations [4]. Moreover, comparative analyses between leadership practices in rural and urban settings remain scarce, despite the fact that such studies could provide invaluable information on how leadership practices can be adapted to the unique needs of different environments [5].

The Full Range Leadership Model (FRLM) serves as a robust framework for understanding leadership behaviors across a spectrum—from transformational leadership to laissez-faire leadership [6]. Transformational leadership is widely regarded for its positive impact on employee engagement, satisfaction, and overall performance, with numerous studies highlighting its superior effectiveness in fostering motivation and organizational commitment. Transactional leadership, which relies on structured rewards and punishments to drive performance, is often considered less effective in comparison. While transactional leadership can yield satisfactory short-term results, it tends to produce sub-optimal outcomes in the long term, particularly in environments where innovation, engagement, and proactive problem-solving are crucial. In contrast, transformational leadership fosters a more enduring commitment to organizational goals, promoting higher levels of job satisfaction, creativity, and overall performance. This distinction is supported by a large body of research demonstrating that transformational leadership is generally more effective than transactional leadership in cultivating positive work environments and achieving long-term organizational success [7,8]. In turn, laissez-faire leadership is marked by a lack of decision-making and direction, often leading to disengagement and suboptimal organizational performance [7,8]. Different leadership styles are critical to understanding how leadership influences healthcare organizations, particularly those facing challenges in terms of staffing and resource management.

Healthcare organizations, as complex social systems, are primarily driven by the effectiveness and dedication of their human resources. The success of these organizations is contingent upon the ability of both managers and staff to collaborate effectively toward achieving common goals. In these systems, leadership plays a pivotal role in shaping organizational culture, ensuring the alignment of staff with the mission and objectives of the healthcare institution, and fostering positive patient outcomes [9]. Therefore, the role of leadership is not only to direct but also to inspire and engage healthcare professionals to perform at their best.

In Mongolia, the healthcare sector faces many of the global challenges discussed above, particularly in terms of leadership and workforce distribution. Despite significant advancements, including an 8.2% increase in healthcare facilities and a 3.9% growth in the workforce between 2020-2021, there remain critical challenges such as an uneven doctor-to-nurse ratio and stark disparities in healthcare access between urban and rural regions [11]. Ulaanbaatar, the capital city, hosts 47.6% of the population, despite occupying only 0.3% of the country's territory. This concentration of the population has led to increased demand for healthcare services in the capital, while rural areas continue to struggle with limited access and resources [12]. These disparities are further compounded by a high rate of migration to urban areas for reasons such as better living conditions, education, employment opportunities, and healthcare access [13]. The urban-rural divide in Mongolia significantly impacts healthcare delivery, and effective leadership is required to bridge this gap. One key challenge is the country's current doctor-to-nurse ratio, which remains below the targeted 1:1.6, with disparities in the patient-to-doctor ratio reaching as much as 45.7% above the standard at family health centers in some regions [11]. These challenges highlight the importance of leadership that is adaptable, strategic, and culturally attuned to both rural and urban healthcare needs.

In this study, we utilize the Multifactor Leadership Questionnaire (MLQ-5X), the most widely used measure of leadership styles, to compare leadership practices between urban and rural healthcare organizations in Mongolia. Transformational leadership and transactional leadership will positively influence key outcomes such as work engagement, organizational commitment, and job satisfaction, consistent with findings from similar studies in other countries [6,8]. In contrast, laissez-faire leadership will have a negative impact on these outcomes, as seen in previous studies on leadership effectiveness in healthcare organizations [7].

The primary aim of this study is to comparatively analyze leadership styles in urban and rural healthcare settings in Mongolia against international benchmarks, generating insights to inform policy and enhance administrative decision-making for improved efficiency and effectiveness. In Mongolia, there are significant disparities between urban and rural healthcare settings in terms of infrastructure, human resources, and access to professional development [1]. These structural and contextual differences are likely to influence how leadership is practiced. Therefore, this study hypothesizes that leadership styles differ between urban and rural healthcare organizations in Mongolia. Urban healthcare organizations are typically better resourced, have more specialized staff, and provide greater access to leadership development and modern management practices. These factors create a favorable environment for transformational leadership, which emphasizes innovation, shared vision, and staff empowerment [2,3]. Transformational leaders are more likely to emerge in urban settings where organizational complexity and expectations for strategic leadership are higher. Conversely, rural healthcare facilities often operate under challenging conditions—limited staff, equipment shortages, and administrative burden. In such constrained environments, transactional leadership, which focuses on task completion, role clarity, and short-term objectives through rewards and corrections, may be more prevalent out of necessity [4]. This style may help maintain basic functionality but is less effective in driving engagement or innovation. Cultural context also plays a critical role. According to Hofstede's cultural dimensions, Mongolia is considered a high-power distance society, meaning hierarchical authority is more readily accepted, and leadership is expected to be directive [5]. These cultural norms may reinforce more traditional or transactional leadership styles, especially in rural areas where social change is slower.

MATERIAL AND METHODS

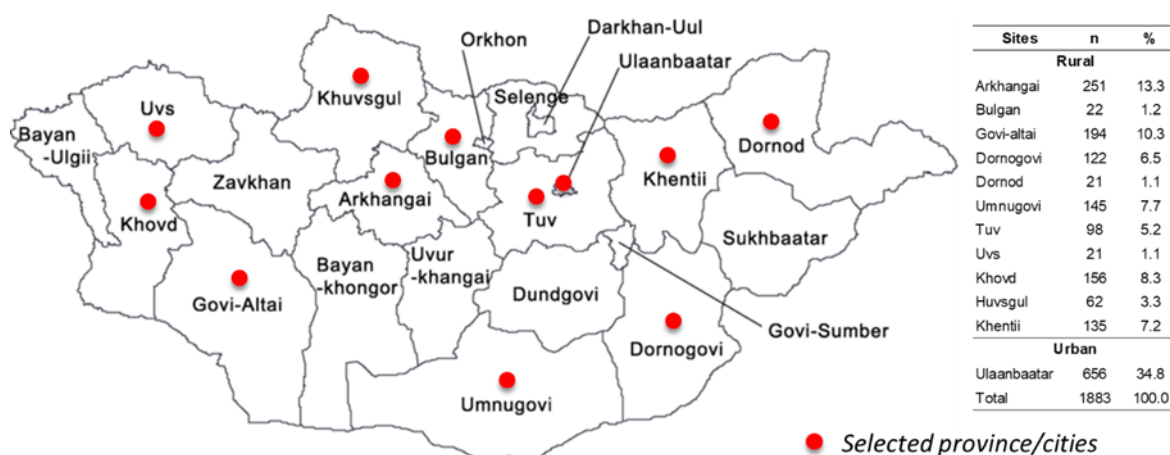
STUDY DESIGN

The study was conducted using a quantitative method, a multi centre, cross-sectional design according to the STROBE guidelines.

STUDY SETTING AND SAMPLE

In Mongolia, approximately 22% of the total healthcare workforce are doctors, amounting to around 14,000 individuals. A total of 1883 healthcare professionals were recruited from 4 regions and 11 provinces across Mongolia, including institutions from both the capital city (Ulaanbaatar) and other rural provinces (Figure 1). We included 1,532 cases evaluating department heads and directors in the analysis. Stratified random sampling was employed based on hospital location and job position to ensure proportional representation and reduce sampling bias. This method was considered appropriate for capturing the structural and geographical diversity of Mongolia's public healthcare system. The participants held a range of professional roles, including hospital directors, department heads, physicians, nurses, midwives, laboratory technicians, radiology technicians, and public health officers. Participants were recruited through coordination with the human resources departments of public hospitals. Each hospital provided a staff list, from which a professional researcher randomly selected potential participants using an informed consent. Before enrollment, selected individuals were screened to confirm their eligibility. Participants were eligible for inclusion if they were employed full-time at a public hospital (a), had held their current position for at least six months (b), and voluntarily provided informed consent. No incentives were provided to participants in the study.

FIGURE 1. SELECTED PROVINCES FOR STUDY



Mongolia is divided into four regions (21 province and capital city), and the survey included participants from all these regions. Each province has a central hospital, and the survey selected participants from both the central hospital and primary healthcare centers for inclusion.

DATA COLLECTION PROCEDURE

Permission to conduct this study was obtained from the Ministry of Health of Mongolia. Upon receiving approval, logistical arrangements were made to administer the survey across 14 public healthcare institutions, including those in both urban centers and rural provinces. Coordination with hospital administrators and human resources departments facilitated smooth data collection. Data were collected through interviews by a trained researcher based on the questions.

MEASUREMENTS

Our primary objective was to assess the level of leadership and their styles among managerial staff in Mongolia's healthcare sector. The level of leadership was measured using the MLQ-5X (Multifactor Leadership Questionnaire), a validated tool for assessing various leadership styles and outcomes.

The Multifactor Leadership Questionnaire (MLQ-5X) was originally developed in English. It consists of 45 items that assess various aspects of leadership, including transformational, transactional, and passive-avoidant leadership styles, along with

outcomes such as effectiveness, satisfaction, and extra effort. Respondents rated each item on a 5-point Likert scale, ranging from 0 ("Not at all") to 4 ("Frequently, if not always").

This questionnaire assesses several dimensions of leadership, including transformational leadership, which is characterized by the ability to inspire and motivate employees through a shared vision, fostering innovation and commitment. Transactional leadership, on the other hand, focuses on the use of rewards and punishments to manage employee behaviors, maintaining order and achieving short-term goals. The questionnaire also measures *Laissez-Faire Leadership*, a style in which leaders avoid taking responsibility or making decisions, often disengaging from critical situations.

Additionally, the MLQ-5X evaluates the outcomes of these leadership styles, including the effectiveness of leadership in the workplace, the level of employee satisfaction with their leaders, and the extra effort that employees are willing to put in as a result of their leaders' influence. Each of these aspects is measured through the respondents' perceptions of their leadership environment, allowing for an in-depth understanding of the leadership styles and their impact on employees in the Mongolian healthcare system.

DATA ANALYSIS

All statistical analyses were performed using **STATA** 18 software. The reliability of the translated MLQ-5X was evaluated using Cronbach's alpha, which is reported in Tables 2, 3. This test measured the internal consistency of the questionnaire items, ensuring that the items within each leadership style dimension were reliability measuring the intended constructs. To evaluate the construct validity of the Mongolian version of the MLQ-5X, both Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) were conducted. Prior to PCA, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were assessed to ensure the suitability of the data for factor analysis. The KMO value was acceptable (≥ 0.6), and Bartlett's test was statistically significant ($p < 0.001$), indicating the data were appropriate for factor extraction.

A scree plot was used to determine the number of components to retain. Factor loadings of 0.40 or higher were considered significant, while cross-loadings exceeding 0.50 were used as a threshold for item exclusion to ensure clear factor separation. Based on these criteria, items were grouped according to their strongest loadings to represent distinct leadership constructs.

We then conducted independent sample T-tests and Mann-Whitney U test to compare these scores across region (urban versus rural). This analysis offers insights into potential variations in leadership perceptions based on demographic factors, contributing to the scholarly understanding of organizational dynamics.

ETHICAL CONSIDERATIONS

The Mongolian National University of Medical Science's Ethical Review Board's ethical approval was sought. The research was approved by the Ethics Committee of Research of the Mongolian National University of Medical Sciences on February 18, 2022 (approval number 2022/3-02).

RESULTS

A total of 1532 healthcare professionals participated in the study, with 33.6% from urban and 66.4% from rural areas. Most participants were female (88.8%) with a mean age of 38 ± 9.8 years; rural participants were significantly older than their urban counterparts ($p < 0.0001$). Similarly, the number of years in hospital was longer in rural areas (median 9 years, range 1–38) than in urban areas (median 5 years, range 1–39, $p < 0.0001$). Nurses and mid-level practitioners were the largest group of professionals (43.9%), followed by doctors (34.9%) (Table 1).

TABLE 1. PARTICIPANTS GENERAL CHARACTERISTIC BY HOSPITAL LOCATIONS

Variables	Hospital locations				P value	Total	
	Urban		Rural			n	%
	n	%	n	%			
Age, years, mean±std†	37±9.8		39±9.7		<0.0001	38±10.0	
Work experiences, years, median (min-max)‡	5.0 (1-39)		9.0(1-38)		<0.0001	8.0 (1-39)	
Gender					0.375		
Male	63	12.2%	109	10.7%		172	11.2%
Female	452	87.8%	908	89.3%		1360	88.8%
Education level					0.445		
Bachelor	342	66.4%	709	69.7%		1051	68.6%
Master	67	13.0%	114	11.2%		181	11.8%
Doctors	4	0.8%	4	0.4%		8	0.5%
Missing	102	19.8%	190	18.7%		292	19.1%
Level					0.006		
Head of department	14	2.7%	60	5.9%		74	4.8%
Health workers	501	97.3%	957	94.1%		1458	95.2%
Professions					<0.0001		
Doctor's	195	37.9%	339	33.3%		534	34.9%
Nurses	236	45.8%	437	43.0%		673	43.9%
Lab technician,	30	5.8%	57	5.6%		87	5.7%
Social worker, public health researcher	15	2.9%	4	0.4%		19	1.2%
Pharmacist	16	3.1%	26	2.6%		42	2.7%
Others	4	0.78%	8	0.79%		12	0.8%
Missing value	19	3.7%	146	14.4%		165	10.8%
Total	515	33.6%	1017	66.4%		1532	100.0%

Health workers are now working at medical units that included doctors, nursing and. Others -, $\ddagger$ - Mann-Whitney U test, $\pm$ - Student T test, Others are health supporter workers that included radiology technicians, and public health officers,

MLQ-5X RELIABILITY AND VALIDATIONS

The data were analyzed using the Cronbach's alpha test, and the test value was 0.7 or greater, indicating that the questionnaire was reliable. The values of all subgroups were high, indicating strong reliability. Transformational Leadership (0.968) and Outcomes of Leadership (0.964) show excellent reliability, while Transactional Leadership (0.913) also has very good consistency. Laissez-Faire Leadership (0.834) is slightly lower but still acceptable. The overall Cronbach's alpha of 0.973 suggests the entire questionnaire is highly reliable, effectively measuring leadership styles and outcomes. The data were analyzed using the Kaiser–Meyer–Olkin test, and the test value was 0.87 or greater, indicating that the data were suitable for analysis. In the analysis, the loadings on the variable group were set to be 0.4 or higher. Also, if the loadings on other groups of variables (cross loading) were 0.4 or higher, double loading was considered.

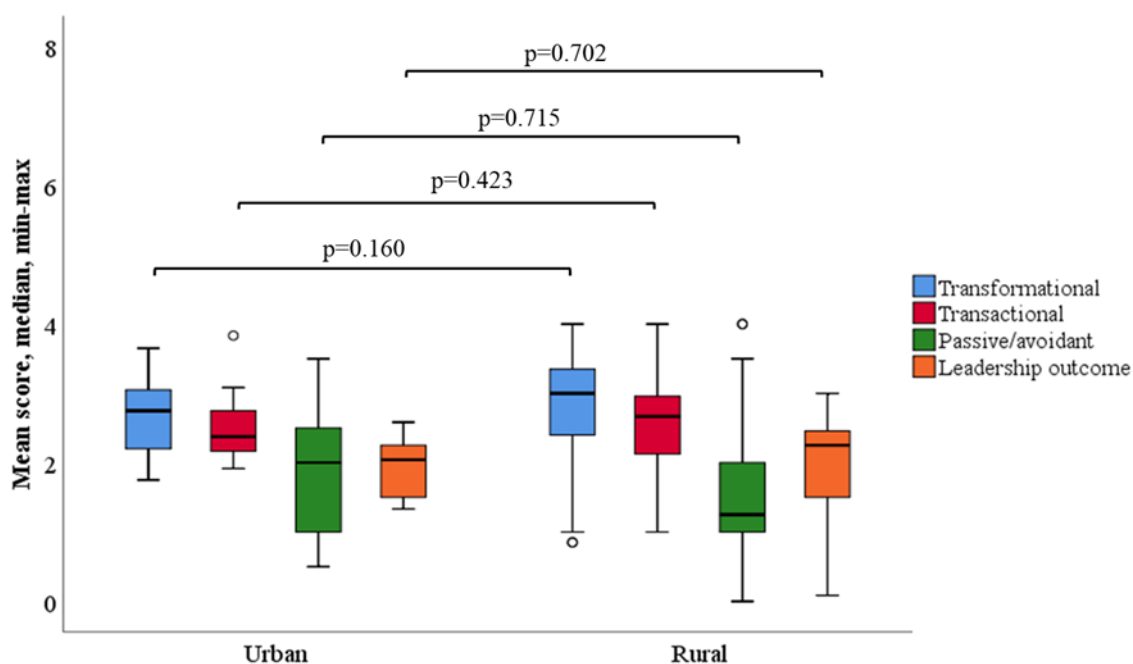
HEADS OF DEPARTMENT LEADERSHIP STYLE BY REGIONS

Transformational leadership had the highest mean scores among the two positive leadership styles for Heads of Department, with subscale means ranging from 2.51 to 2.63 (SD $\approx$ 1.0). The highest-rated component was *Inspirational Motivation* (M = 2.63, SD = 1.08), indicating that leaders were perceived as motivating and visionary. All components of transformational leadership were strongly and positively correlated with leadership outcomes such as Extra Effort, Effectiveness, and Satisfaction, with correlation coefficients ranging from $r = 0.684$ to 0.876 ($p < 0.01$). *Transactional leadership*, particularly *Contingent Reward*, also showed strong positive correlations with leadership outcomes (e.g., $r = 0.789$ with Extra Effort, $r = 0.808$ with Effectiveness). However, the scores for transformational and transactional leadership were both significantly lower than the benchmark scores (ERS) ($p < 0.0001$).

In contrast, the passive/avoidant leadership scores of department heads were statistically significantly higher than the international standard scores, which is noteworthy ($p < 0.0001$). As expected, passive/avoidant leadership components showed weak or negligible correlations with leadership outcomes. For example, *Laissez-faire* leadership was only weakly related to *Satisfaction* ($r = 0.047$) and *Effectiveness* ($r = 0.049$), indicating its limited effectiveness in generating positive outcomes (Table 2).

The leadership styles of department heads demonstrated mean differences between urban and rural areas, but these were not statistically significant (Figure 2). Transformational leadership score was rated at 2.57 ± 0.92 in urban areas and similar at 2.51 ± 0.95 in rural areas. Transactional leadership scores were nearly identical, with means of 2.52 ± 0.92 (urban) and 2.50 ± 0.90 (rural). Passive leadership was rated at 1.97 ± 0.84 in urban locations and 1.98 ± 0.83 in rural areas. Leadership outcomes received equal ratings from both groups (2.55 ± 1.02 for urban areas and 2.55 ± 1.00 for rural areas).

FIGURE 2. HEAD DEPARTMENTS/MEDICAL UNITS LEADERSHIP STYLES BY LOCATION, MANN-WHITNEY U TEST



HOSPITAL DIRECTORS' LEADERSHIP STYLE BY REGIONS

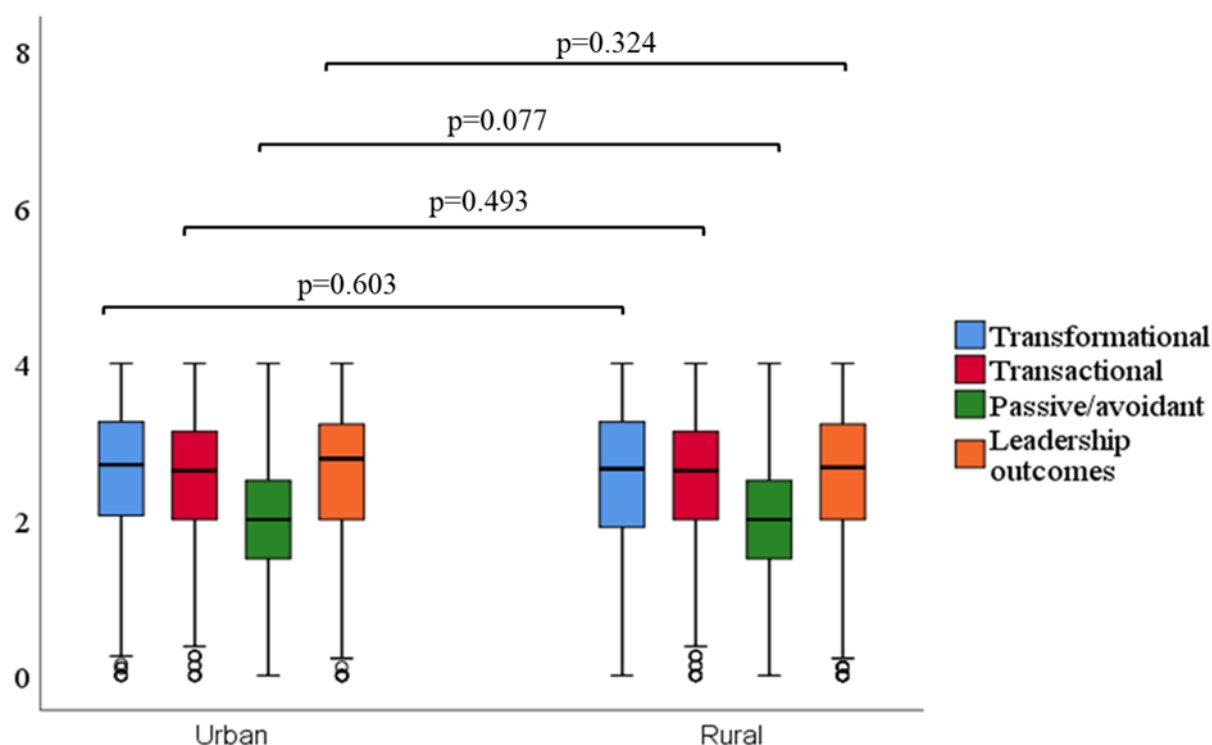
The transformational leadership score for hospital directors was higher than other styles but remained below ERS ($p < 0.0001$). Passive/avoidant (*laissez-faire*) leadership scores were higher than ERS ($p < 0.0001$) (Table 3).

The analysis reveals that transformational leadership is the strongest leadership style in terms of both impact and consistency. In contrast, transactional leadership is moderately impactful. Contingent reward (mean = 2.67, std = 0.93, ERS = 2.77) showed strong positive correlations with transformational leadership behaviors, suggesting that rewarding followers for performance does involve elements of transformational leadership. Transformational leadership strongly correlated with positive outcomes like Extra Effort, Effectiveness, and Satisfaction, with Inspirational motivation and Individual consideration having the highest correlations. Contingent reward also showed strong correlations with these outcomes, indicating the effectiveness of transactional leadership. Passive/avoidant leadership styles, such as *Laissez-faire*, showed weaker correlations with outcomes, reinforcing that they are less effective. Overall, transformational leadership was the most influential, followed by transactional leadership, with passive styles having the least impact.

Leadership style ratings of hospital directors, as perceived by health workers, did not show statistically significant differences between urban and rural areas ($p > 0.0001$). Transformational leadership was rated slightly higher in rural areas (2.75 ± 0.82) than in urban areas (2.73 ± 0.57). Transactional leadership scores were similar across locations, with means of 2.66 ± 0.81 (rural) and 2.64 ± 0.52 (urban). However, passive leadership was rated lower in rural settings (1.84 ± 0.71)

compared to urban areas (2.07 ± 0.81). Leadership outcomes were also rated more favorably in rural areas (2.74 ± 0.91) than in urban settings (2.59 ± 0.62). Despite the relatively small mean differences, all comparisons between urban and rural responses were not statistically significant, suggesting that perceptions of leadership styles and outcomes differ meaningfully by location (Figure 3).

FIGURE 3. DIRECTORS OF HOSPITALS LEADERSHIP STYLES BY LOCATION, MANN-WHITNEY U TEST



DISCUSSION

Our study is the first to quantitatively assess the leadership styles and outcomes of administration of Mongolian hospitals. Healthcare employees assessed the heads of their departments and the directors of their hospital using the MLQ-5X questionnaire.

HEAD OF DEPARTMENT LEADERSHIP STYLES

There were no statistically significant differences in leadership styles between urban and rural settings. Avoidant leadership scores were notably higher than transformational and transactional styles compared to international benchmarks. The results showed that transformational leadership among Mongolian department heads (mean = 2.53 ± 1.04) was significantly lower than benchmark scores from both regional and international studies. For instance, transformational scores reported in Iran [24] (3.21 ± 0.57), India [26] (2.88 ± 0.62), and Malaysia [25] (3.15 ± 0.69) suggest more prominent vision-oriented leadership in neighboring countries. The disparity is even more pronounced when compared to European counterparts such as Germany [27] (3.43 ± 0.50) and the UK [28] (3.25 ± 0.70).

Mongolian department heads demonstrated a higher tendency toward passive-avoidant leadership (mean = 1.98 ± 1.00), in some cases exceeding or aligning with figures from Iran [24] (2.01 ± 0.49) and India [26] (2.14 ± 0.52), but remaining below some reports from European settings such as Norway [29] (2.20 ± 0.53). The elevated scores for management-by-exception (active) - a component of transactional leadership - (overall transactional mean = 2.51 ± 0.98) indicate a reactive leadership style. This may reflect contextual barriers such as limited leadership training, constrained resources, or hierarchical decision-making structures common in Mongolian public hospitals.

DIRECTORS OF HOSPITAL LEADERSHIP STYLE

This study also represented the first nationwide analysis of leadership styles among hospital directors across urban and rural healthcare institutions in Mongolia. Knowledge and understanding of leadership remain limited for both Directors and Heads of Department and similar across urban and rural settings.

The findings revealed a similar pattern to department heads, with hospital directors scoring lower in transformational leadership (mean = 2.53 ± 1.04) and higher in passive–avoidant behavior (mean = 1.98 ± 1.00) compared to international norms. For instance, hospital leadership in the USA [30] (3.38 ± 0.55), Canada [31] (3.29 ± 0.62), and Brazil [32] (3.10 ± 0.68) consistently demonstrated stronger transformational practices and higher leadership outcomes (USA: 3.32 ± 0.58 ; Canada: 3.26 ± 0.60 ; Brazil: 3.12 ± 0.59).

Transactional leadership scores for Mongolian directors (2.51 ± 0.98) were comparable to or slightly lower than those reported internationally (e.g., India: 2.96 ± 0.55 [26]; Germany: 2.90 ± 0.60 [27]; USA: 3.02 ± 0.51 [30]), but the reliance on management-by-exception suggests a reactive rather than developmental approach. Despite these limitations, some positive findings emerged. The contingent reward component of transactional leadership showed a strong positive correlation with leadership outcomes, such as staff effectiveness, satisfaction, and willingness to exert extra effort, suggesting that certain transactional behaviors can have beneficial effects when used strategically.

The consistent leadership profiles found across both department heads and hospital directors may reflect Mongolia's legacy of centralized, compliance-driven health governance. Historically, leadership roles have been defined more by administrative authority than by innovation or vision, resulting in a standardized leadership culture that may inhibit the proactive behaviors required in dynamic healthcare environments. Rather than undermining the contribution of our findings, this uniformity highlights systemic constraints and emphasizes the need for reform. The low levels of transformational leadership and elevated passive–avoidant tendencies will be contributing to diminished staff motivation, poor team coordination, and limited responsiveness to healthcare demands, particularly in under-resourced settings. Addressing these challenges requires targeted strategies such as embedding leadership development within medical education, promoting participatory governance, and encouraging mentoring systems to strengthen leadership competencies from within.

Furthermore, the observed uniformity in leadership styles across regions does not imply equal performance; instead, it invites closer examination into how similar behaviors may yield different outcomes based on local conditions such as resource availability, workforce stability, or community expectations.

Finally, although this study was not designed to analyze leadership history, it is important to acknowledge that Mongolia's transition from Soviet-influenced managerial models to more decentralized systems continue to influence current leadership norms. Future research exploring this historical trajectory could deepen understanding of how entrenched institutional cultures affect leadership efficacy today.

These combined findings indicate a national trend of underdeveloped transformational leadership and elevated passive behaviors among healthcare administrators, emphasizing the need for capability-building programs tailored to Mongolia's health sector leadership needs.

STUDY STRENGTHS AND LIMITATIONS

This study offers several strengths. It is the largest and first nationwide quantitative investigation of leadership styles among Mongolian healthcare administrators, employing the well-validated MLQ-5X tool [23]. The sample included 1,458 participants from both urban and rural hospitals, enhancing the representativeness of the findings. Internal consistency was excellent across all subscales (Cronbach's alpha > 0.9), affirming the reliability of the instrument. Comparative insights were strengthened by benchmarking findings against regional and global studies [24–32].

However, the study has some limitations. Its cross-sectional design restricts causal inferences between leadership styles and their perceived outcomes. Self-reported data introduces the risk of social desirability and subjective bias. Whilst

international comparisons offer valuable context, caution is needed due to cultural and organizational differences that may shape leadership perceptions. Response rates in rural areas may also have been affected by logistical or technological constraints, and the absence of longitudinal data limits conclusions about leadership development over time.

This study revealed that both department heads and hospital directors in Mongolian hospitals exhibit low transformational and high passive–avoidant leadership styles, reflecting a concerning trend of disengaged leadership. The results highlight the urgent need for targeted leadership development and policy reforms to promote proactive and visionary leadership. Future research should include longitudinal and qualitative studies to understand the root causes and long-term impacts of leadership behaviors, whilst practical efforts must focus on integrating leadership training into health education and institutional practices.

CONCLUSIONS

For both hospital directors and department heads, transformational leadership is the most prevalent positive leadership style in Mongolia. However, both transformational and transactional leadership styles score significantly lower than ERS and avoidant leadership scores are higher than the international average.

Addressing these challenges requires targeted strategies at national policy level such as embedding leadership development within medical education, promoting participatory governance, and encouraging mentoring systems to strengthen leadership competencies from within. This will positively impact on employee satisfaction, leadership outcomes and hospital performance.

Future research and implementation should focus on developing leadership approaches tailored to the specific characteristics of urban and rural healthcare environments, which is critical for the Mongolian health sector. Future studies should also explore causal relationships and include qualitative insights to deepen understanding of leadership's role in healthcare delivery.

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TABLE 2. HEAD DEPARTMENTS LEADERSHIP STYLE IN MONGOLIAN HOSPITALS

Variables	Mean $\pm$ SD	ERS	1	2	3	4	5	6	7	8	9	10	11	12	Alpha
Transformational															
(1) Idealized influence: attributed<	2.51 $\pm$ 1.03	2.72	1												0.840
(2) Idealized influence: behavior<	2.59 $\pm$ 0.99	2.69	.797**	1											0.880
(3) Inspirational motivation<	2.63 $\pm$ 1.08	2.83	.754**	.800**	1										0.854
(4) Intellectual stimulation<	2.4 $\pm$ 1.02	2.82	.749**	.757**	.780**	1									0.945
(5) Individual consideration<	2.52 $\pm$ 1.07	2.66	.738**	.758**	.767**	.857**	1								0.909
Transactional															
(6) Contingent Reward<	2.48 $\pm$ 1.04	2.77	.707**	.712**	.748**	.783**	.815**	1							0.915
(7) Management by exception: active>	2.53 $\pm$ 0.92	2.33	.575**	.569**	.617**	.641**	.639**	.705**	1						0.916
Passive/avoidant															
(8) Management by exception: passive>	2.21 $\pm$ 0.96	1.10	.425**	.463**	.458**	.498**	.497**	.521**	.639**	1					0.822
(9) Laissez –faire>	1.74 $\pm$ 1.05	0.79	0.038	.076**	.053*	.079**	.068**	.071**	.183**	.369**	1				0.845
Leadership outcomes															
(10) Extra Effort<	2.55 $\pm$ 1.03	2.75	.684**	.706**	.732**	.744**	.781**	.789**	.651**	.517**	.082**	1			0.905
(11) Effectiveness<	2.53 $\pm$ 1.07	3.01	.701**	.711**	.737**	.736**	.785**	.808**	.636**	.503**	0.049	.876**	1		0.921
(12) Satisfaction<	2.56 $\pm$ 1.07	2.94	.689**	.683**	.703**	.709**	.744**	.774**	.632**	.494**	0.047	.817**	.886**	1	0.916

< Significantly lower than ERS, > Significantly higher than ERS by One sample T test, ** Pearson's correlation is significant, p<0.001, Alpha is Cronbach alpha coefficients

TABLE 3. DIRECTORS OF HOSPITALS LEADERSHIP STYLE IN MONGOLIA

Variables	Mean, SD	ERS	1	2	3	4	5	6	7	8	9	10	11	12	Alpha
Transformational															
(1) Idealized influence: attributed	2.79±0.79>	2.72	1												0.875
(2) Idealized influence: behavior	2.65±0.88<	2.69	.797**	1											0.875
(3) Inspirational motivation	2.83±0.81	2.83	.754**	.800**	1										0.928
(4) Intellectual stimulation	2.69±0.89<	2.82	.749**	.757**	.780**	1									0.901
(5) Individual consideration	2.78±0.89>	2.66	.738**	.758**	.767**	.857**	1								0.936
Transactional															
(6) Contingent Reward	2.67±0.93<	2.77	.707**	.712**	.748**	.783**	.815**	1							0.926
(7) Management by exception: active	2.64±0.76>	2.33	.575**	.569**	.617**	.641**	.639**	.705**	1						0.807
Passive/avoidant															
(8) Management by exception: passive	2.22±0.86>	1.10	.425**	.463**	.458**	.498**	.497**	.521**	.639**	1					0.737
(9) Laissez –faire	1.74±1.05>	0.79	0.038	.076**	.053*	.079**	.068**	.071**	.183**	.369**	1				0.811
Leadership outcomes															
(10) Extra Effort	2.71±0.84<	2.75	.684**	.706**	.732**	.744**	.781**	.789**	.651**	.517**	.082**	1			0.879
(11) Effectiveness	2.72±0.98<	3.01	.701**	.711**	.737**	.736**	.785**	.808**	.636**	.503**	0.049	.876**	1		0.936
(12) Satisfaction	2.72±0.9<	2.94	.689**	.683**	.703**	.709**	.744**	.774**	.632**	.494**	0.047	.817**	.886**	1	0.908

< Significantly lower than ERS, > Significantly higher than ERS by One sample T test, ** Pearson's correlation is significant, p<0.001, Alpha is Cronbach alpha coefficients

APPENDIX

SUPPLEMENT TABLE 1. MLQ-5X QUESTIONNAIRE VALIDATION BY PRINCIPAL COMPONENT ANALYSIS

Variables	F1	F2	F3	F4
Talks only on most important values and beliefs	0.668			
Specific importance of having a strong sense of purpose	0.719			
Considers moral & ethical consequences of decisions	0.745			
Emphasizes importance of group's mission	0.770			
Instills pride in me for being associated with her/him	0.779			
Goes beyond self-interest for the good of staff	0.640			
Have my respect	0.636			
Displays sense of power and confidence in me	0.808			
Articulates a compelling vision	0.795			
Discusses with specific terms who is responsible for achieving performance targets	0.817			
Talks optimistically about future	0.820			
Expresses confidence on goal achievement	0.826			
Raises critical assumption to question whether they appreciate or not	0.790			
Suggests new ways to completing my work	0.705			
Seeking different perspective in problem solving	0.826			
Allows me look at problems different angles	0.841			
Spends time on training and coaching	0.726			
Treats me as individual rather than member of group	0.813			
Considers me as having different needs/abilities/aspiration	0.839			
Helps me to develop my strength	0.861			
Provides with assistants an exchange for my effort			0.800	
Clarifies my expectation when meeting perform expectation goal			0.822	
Is excited about what needs to be accomplished			0.800	
Expresses satisfaction when meeting performance			0.802	
Focuses attention on irregularities /mistake deviation from standards			0.590	
Gives all attention in dealing with mistake/complains/failure			0.530	
Keeps track of all mistakes			0.710	
Directs my attention towards failures to meet standards			0.644	
Wait for things go to wrong before taking action		0.727		
Do not fail interfere until the problem is serious		0.602		
Hospital believes in not making changes unless necessary		0.474		
Takes action only when problems become serious		0.614		
Avoids getting involved when important issues arise		0.850		
Is absent when needed		0.844		
Avoids making decisions		0.826		
Delays responding to urgent questions		0.408		
I demonstrate that I can accomplish more than expected using effective methods				0.780

Variables	F1	F2	F3	F4
I enhance motivation and desire to succeed				0.837
I encourage greater work effort				0.825
I use effective methods when working with colleagues				0.839
I enjoy working with my team				0.841
I discuss the needs my employees require to perform				0.823
I defend my employees' interests to senior leadership				0.805
I meet organizational demands effectively				0.791

THE COMPETENCIES USED BY HEALTH SECTOR INFORMATION QUALITY ADVOCATES TO IMPROVE DATA QUALITY

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ABSTRACT

BACKGROUND:

The role of an Information Quality Advocate (IQA) has emerged as critical in ensuring the reliability, applicability, and usability of health information across its lifecycle. IQAs bridge gaps between stakeholders, integrating data management processes and promoting informed decision-making.

OBJECTIVES:

Building on previous research that identified broad competency areas for IQAs, this study explores the specific competencies required for effective IQA performance.

DESIGN:

A qualitative content analysis was conducted using data from semi-structured interviews with eighteen IQAs identified across various countries. The interview schedule attempted to reveal required competencies for the IQA's current and most recent job and for dealing with critical incidents. All IQAs were also asked to detail their 'top four' competencies for the IQA role. The competencies were categorized into conceptual, human, and technical skills, and IQAs assigned into top, middle, and lower management level classifications.

RESULTS:

Findings revealed distinct skill requirements at each different management level, highlighting the evolution of competencies as IQAs progress within organizational hierarchies. Top management requires strategic conceptual skills such as stakeholder engagement and change management and advocates for data quality at a high level, whereas middle and lower management focus more on project management and technical problem solving. At all levels high order communication skills and the capacity to initiate and sustain collaboration are important IQA competencies.

CONCLUSIONS:

This research provides a nuanced understanding of the competencies required for IQAs, supporting the development of targeted training programs and promoting cohesive, high-quality data management practices in healthcare settings. Future work could investigate the relationship between data maturity contexts and the competencies required for IQAs.

This would involve employing a data maturity classification method, with the WHO's SCORE tool being a practical choice due to its widespread application and relevance.

KEYWORDS

information quality advocacy, competency frameworks, healthcare data management, clinical information quality

INTRODUCTION

Globally, healthcare expenditures account for a substantial proportion of many nations' gross domestic product (GDP). In 2022¹ countries like the United Kingdom and Sweden allocated 11% of their GDP to healthcare. This significant investment reflects the importance for efficient and effective health services to maximize health outcomes and patient satisfaction. To achieve this, health systems are increasingly investing in clinical information technology systems, such as electronic health records and electronic finance systems. At the same time, healthcare systems are also placing a greater emphasis on improving the quality of the clinical information to ensure that healthcare delivery is safe, effective, and patient-centered, while also providing mechanisms for accountability and continuous improvement [1].

High quality clinical information supports the establishment of benchmarks that gauge the performance of healthcare providers, informs healthcare providers in refining their clinical practices and organisational processes, and ensures consistency in care delivery across different settings and providers [2]. Good clinical information can enhance coordination and collaboration among different healthcare providers, reduce the incidence of complications, and minimize the need for repeated health care utilisation, leading to cost efficiencies for healthcare systems and more integrated and seamless patient care [3].

To maximise data quality, it is essential to develop a skilled workforce that is capable of handling the complexities of information technology systems and the resulting health information. Data collection, analysis, interpretation, and response requires a range of health professionals working together, including, clinicians, health informatician, data analysts, data custodians, data stewards, clinical coders, health information managers, and finance managers [4; 5]. However, these professionals tend to function, like many other specialised professions in the healthcare system, in operational silos that are connected but not always integrated [6] leading to potential duplication, while responsibility for other areas of the cycle from data collection to action may be unallocated leading to potential gaps. . Therefore, there is a need for a dedicated role to oversee and seamlessly integrate information quality processes in healthcare settings. An information quality advocate (IQA), a function previously identified and termed by Ridoutt, et.al. [7], ensures the integrity, reliability, applicability and interpretation of health information throughout its lifecycle. IQAs bridge gaps between various stakeholders, promoting cohesive data management and informed decision-making. Where IQAs exist, they significantly enhance the validity, reliability, and fitness for the purpose of collected data [1]. The function is not new but, recognising this role as an IQA, is new. One purpose in publishing this research is to advocate for the recognition of this role

Previous research [7] recognised the need for focused training programs to develop skilled IQAs and identified key broad competency areas. The current study aims to delve deeper into the specific competencies required for effective IQA performance. The key objectives of this research are to:

- (1) identify the competencies used by people already working as IQAs,
- (2) compare these competencies to those identified previously, and
- (3) contextualise the competencies by differentiating the competency requirements based on different contexts, particularly considering the management level of the IQAs.

¹ Available at <https://apps.who.int/nha/database/Select/Indicators/en>. Accessed 12 July 2024

METHODS

STUDY DESIGN

Interviews were conducted using a semi-structured interview approach. The interview schedule was developed based on a comprehensive review of existing literature on IQA competencies and informed by the research team's preliminary findings [7]. The schedule (Appendix A) was designed to ensure consistency in data collection while allowing flexibility to explore unique perspectives. The interview schedule included the following five areas:

1. Interviewee background characteristics: profession, designated role, seniority, career pathway, geographic and service location, etc.
2. Current position and perceived types and levels of competence required for the IQA role.
3. Previous positions (career path) and the competencies required to perform previous roles.
4. Data quality successes and the barriers to achieving data quality, explored through a critical incident approach as described by Flanagan [8].
5. Perceived key competency requirements for the IQA role.

Note that data collected from the interviews on the competencies required for previous positions and on the critical incidents is not included in this paper. The quality and usefulness of analysis of the previous positions, which was meant to explore evolving competency requirements, was undermined by previous positions being 'too close' to current positions consequent of sideways job movements, or by positions being 'too distant' to current positions, the result of a dramatic change in career from say clinician to IQA (this was more common in Pacific Island Countries). It was found that analysis of the current position requirements when cross-tabulated with management level provided more useful insight to the changing competency requirements of career progression. The critical incident data will be the subject of a separate paper.

RECRUITMENT OF INTERVIEW SUBJECTS

Prospective interviewees were recruited through a judgement sampling process and supported where necessary, by snow-balling techniques (that is interviewees were asked to nominate other IQAs for possible interviews). The interviewees were selected from regions around the world that have implemented the Australian classification system ICD-10 AM for diseases and ACHI procedure classification. While the results apply across the health system, the choice of a common classification system was to remove any potential jurisdictional biases. The research team approached individuals that had participated in previous research as well as through trusted intermediaries. The potential for under representation in the number of interviewees was countered by the selection of respondents that had a disproportionate responsibility in an "expert" capacity of total health systems.

Interviewees were considered to be in an IQA role if they met the following criteria:

- Occupying a senior or executive-level role within a large hospital, a regional health administration, ministry of health, etc. with the capacity to influence data quality or ambition to obtain such a role.
- Using information in decision making processes, or facilitating or advocating for information use by others in acute, outpatient, community or population health settings.
- Demonstrating interest in improving data quality for clinical, financial, health services planning or population health purposes.
- Experiencing or observing critical incidents where data quality was impacted, affecting decision-making processes.

Each interviewee's decision to participate in the research was entirely voluntary and based on sufficient information and adequate understanding of both the proposed research and the implications of participation in the research (Australian

National Statement on Ethical Conduct in Human Research, Section 2.2.1 [9]. The recruitment strategy for the research was fully relevant to the research methodology and the potential participants (Section 3.1.12).

DATA COLLECTION PROCEDURE

The interview schedule was sent to each participant prior to the interview so they could prepare. Interviews were then undertaken by a member of the research team in English. Each interview lasted approximately 60 minutes and was conducted via Microsoft Teams or Zoom. Participants were informed of their rights, including the ability to withdraw from the study or discontinue the interview at any time without any consequences.

With the interviewee's consent, interviews were recorded to ensure accurate data capture. Interview notes were kept by interviewers from each interview and where appropriate, the recording of interviews was used to check the accuracy of the notes. Selected interview notes and transcripts, those nominated as particularly interesting or complex by the original interviewer, were reviewed by a second researcher and summary notes edited.

In our study, a formal institutional ethics approval was deemed to be not required. The decision was made under the Australian National Statement on Ethical Conduct in Human Research [9], which allows for exemption from ethics review where research involves negligible risk (Section 2.1) and uses non-identifiable data (Section 3.1).

The study adhered to internationally recognised ethical standards for low-risk professional research. All participants were engaged in their professional capacity, and no personally sensitive data were collected. The interviews focused exclusively on professional roles, experiences, and competencies. All data were anonymised at the point of transcription, and as noted above, informed verbal consent was obtained from participants prior to their participation.

DATA ANALYSIS PROCEDURE

Interview transcripts and notes were circulated amongst the research team and then thematically analysed in three phases. In the first phase, a broad categorisation of the data was performed by using ChatGPT and Co-Pilot. The incorporation of these AI tools streamlined the initial data processing and theme identification phases, initially allowing for efficient handling of large volumes of qualitative data. While providing competency themes that could be readily sense checked, the AI analysis proved to be insufficiently sensitive to variation in the way competencies were being described (and therefore their meaning) by different interview subjects.

In the second phase then, the interviewee sample population was categorised according to their work location, qualification level and professional background into three management levels (i.e., Top, Middle and Lower). The differentiation by management level was based on the participants' stated positions and profiles. Consensus was reached among the research team on this ranking of the participants' profiles.

In the third phase, a comprehensive list of competencies was compiled from the data. These competencies were categorized into conceptual, human, and technical skills using Katz's three-skill approach [10]. Competencies related to decision-making, strategy, or large-scale organizational understanding were classified as 'conceptual' skills. Competencies emphasizing interaction, communication, leadership, or interpersonal dynamics were classified as 'people' skills. Competencies focused on specific tools, technologies, or data management techniques were classified as 'technical' skills. Similar competencies were grouped, duplications were removed, and discrepancies in the classification were discussed by a subset of the author team and resolved through consensus. Finally, frequency analysis was conducted to identify the most commonly reported competencies.

RESULTS

CHARACTERISTICS OF INTERVIEWEES

We conducted 18 interviews. The background of the interviewees is provided in Table 1.

TABLE 1: DISTRIBUTION OF THE INTERVIEW SAMPLE POPULATION BY SELECTED PERSONAL CHARACTERISTICS

Characteristics	N (18)	Percentage (%) of total interviewees
Country		
Kingdom of Saudi Arabia	7	38.9
Australia	5	27.8
Pacific Island Countries	4	22.2
Ireland	2	11.1
Highest qualification		
PhD	2	11.1
Master's degree	14	77.8
Bachelor's degree	2	11.1
Professional / Educational background		
Clinical	10	55.6
Health Information Management/Informatics	5	27.8
Other	3	16.7

Over half of the interview subjects (n=11, 18%) were currently employed by a Ministry of Health or an allied department / agency or the head office of a corporate health entity, while three participants (18%) were working at a regional, 'cluster' or large hospital level in the health system, and two (18%) were employed in national or multinational information institutes, and the rest in consultant or vendor roles (n=2). Most of the interviewee sample population held at least a Master's degree as their highest qualification (two had a Bachelor's degree and two had a PhD). A majority of the interviewees (10/18%) came originally from a clinical background, five from a health information beginning and three from other backgrounds. Interviewees were categorised as top, middle or lower-level management (Table 2).

TABLE 2: DISTRIBUTION OF THE INTERVIEW SAMPLE POPULATION BY MANAGEMENT LEVEL OF CURRENT POSITION (N = 18)

Management level	Typical job titles	Number of interviewees	Percentage (%)
Top Management level	Chief; Director; Consultant or advisor	8	44.4
Middle management level	Manager; Head of Unit	7	38.9
Lower Management level	Data analyst; Administrator	3	16.7

COMPETENCIES REQUIRED AT DIFFERENT MANAGEMENT LEVELS

The competencies required by interviewees to perform their current job was analysed by the management level assigned in Table 2 above. The results of the comparison are shown in Table 3.

TABLE 3: PERCEIVED COMPETENCIES NEEDED BY MANAGEMENT LEVEL OF CURRENT POSITION

Proportion of interviewees	Management level of current position		
	Top Management (n = 8)	Middle Management (n = 7)	Lower Management (n = 3)
Competencies reported by 50% or more interviewees	Knowledge of classifications and pricing models Communication skills Change management Stakeholder management and influence Effective collaboration Project management Training and mentoring Technical competencies	Data analysis and reporting Communication skills Policy knowledge and development	Communication skills Data analysis Technical systems and network understanding Management and coordination skills
Competencies reported by 25-49% of interviewees	Strategic thinking and decision-making Data and system migration Data analysis	Negotiating skills Stakeholder engagement Continuous professional development Quality tools knowledge Project management	Familiarity with software tools (e.g., Power BI) Attention to detail People skills Professional report writing Leadership engagement Self-motivation and initiative

Several competencies are identified as necessary for the IQA role by two or more levels of management (for example 'communication skills' and 'data analysis' skills), while others appear to be more idiosyncratic to a particular manager level (for example 'change management').

ANALYSIS OF THE TOP 4 COMPETENCIES BY SKILL TYPE AND MANAGEMENT LEVEL

At the end of the interview all interview subjects were asked to identify the top four highest priority competencies that an IQA requires. The competencies identified were classified into type of skill categories (conceptual, human, and technical) and then grouped into levels of management (Table 4).

TABLE 4: DISTRIBUTION OF THE TOP FOUR COMPETENCY REQUIREMENTS OF THE INTERVIEW SAMPLE POPULATION BY MANAGEMENT LEVEL OF CURRENT POSITION AND TYPE OF COMPETENCY BEING NOMINATED

Level of management	Type of skill		
	Conceptual skills	Human skills	Technical skills
Top Level Management	Change management Strategic thinking and decision-making	Effective Communication skills Stakeholder management and influence Training and mentoring	Knowledge of classifications and pricing models Data and system migration Risk management

Level of management	Type of skill		
	Conceptual skills	Human skills	Technical skills
Middle Level Management	Project management Quality tools knowledge	Communication skills with managers Leadership skills Stakeholder management and Negotiation Continuous professional development	Data analysis and reporting Policy knowledge and development
Lower Level Management	Problem-solving abilities	Communication skills	Technical systems and network understanding Familiarity with software tools (e.g., Power BI)

COMPARISON WITH PREVIOUS RESEARCH

Six broad competency areas were identified by a third or more of a sample of participants at the 2022 PCSI Conference as important to the capacity of an IQA to perform their role [7]. These six competencies were compared with those reported by interviewees working at the top management level (Table 5).

TABLE 5: COMPARISON OF PREVIOUS AND CURRENT RESEARCH FINDINGS

Originally identified IQA competency requirements [7]	Competency requirements for IQAs identified in this study*	Comment
Data governance principles		Skills in data governance are more strongly required at the 'Middle' management level
Information and system governance	Technical competence in data management and IT systems Analytical and problem-solving skills Knowledge of classifications and pricing models	These competency areas are often grouped together under a broad term of 'Technical and analytical skills'.
Quality management	Change management skills Strategic thinking and decision-making Project management	Slightly stronger relationship with quality management at the 'Middle' management level

Originally identified IQA competency requirements [7]	Competency requirements for IQAs identified in this study*	Comment
Stakeholder engagement	Communication skills Collaboration work Stakeholder management and influence	At lower management levels communication skills and capacity to engender collaboration are important. At top management level these skills support skills in stakeholder analysis and engagement
Develop organisation's information culture		This area of competence was not identified in the current research, although it could be argued to be part of change management
Apply leadership strategies to digital health	Leadership Training and mentoring	Leadership includes critical and strategic thinking and applies at different levels, but arguably Team Leadership is the highest priority

DISCUSSION

COMPETENCIES REPORTED BY INTERVIEWEES

The comparison between competencies needed at different management levels (Table 3) is limited by the smaller number of interviewees in the lower management level, but differences between required skills mix is discernible - especially if the focus is on the more frequently nominated competencies. **Communication skills** and **Data analysis** were required, in some form, at all levels of management. At the top management level, **Change management** and **Stakeholder management and influence** are distinguishing competencies, whereas at middle management level, the requirement for **Policy knowledge and development** competence is a point of differentiation. At lower management levels, **Leadership** (middle management, probably in relation to teams) and **Problem solving** (lower management, probably more technical problems) are differentiating competencies. At higher levels of management there is some degree of idiosyncratic competence requirement for IQAs depending on the specifics of their roles.

Regarding common competencies frequently nominated by all three management levels (e.g., Communication, Data Analysis), they are seemingly applied in different ways at different management levels. In the lexicon of competency-based training and education [11], these types of competencies are called 'nested' competencies where the more advanced levels of capability are reflected in higher order cognitive processes, levels of specialisation and/or autonomy. Table 4, which uses a list of competencies generated from interviewee nomination of their 'top four' competency requirements, compares competencies by level of management and skill type. This provides a slightly different perspective but delivers quite similar results. Technical skills seem to be important at all management levels, albeit the types of technical competence requirements at top management level are arguably more strategic and more cognitively demanding. There are several other competencies that are required by several or all levels of management

(communication related skills, stakeholder management type competencies). Top level management is differentiated by two key competencies 'Change management' and 'Strategic thinking and decision-making'.

COMPARISON WITH PREVIOUS RESEARCH

Using all the findings detailed above regarding the competencies required for the current job and the top four competencies identified by interviewees, five of the six originally identified competencies were validated (Table 6). While largely validating the direction of the original research findings (except for 'Develop organisation's information culture'), the current research builds a stronger and more nuanced picture of competency requirements. For instance, the broad competence of 'Stakeholder engagement' is now better understood as incorporating a suite of competencies such as communication (written and verbal), interpersonal skills, the facilitation of collaborative actions, and stakeholder engagement and management. It also evolves, over a career, to include increasingly external engagement with stakeholders, first with stakeholders outside one's immediate team and eventually with those outside the organisation. In Table 6, the place of 'technical and analytical skills' is interesting. The requirement for these competencies is clearly important, but depending on the role context, the competencies actually applied in the role, can vary from more operational (for instance interpreting complex data sets and extract meaningful insights) to more strategic (for instance using data management systems and technologies to underpin data quality improvements). The findings also seemed to suggest that most technical competencies are acquired earlier in the career of the IQA and just continually built upon to accommodate increasingly strategic contexts.

THE IQA ROLE COMPETENCY REQUIREMENTS ARE CONTEXT INFLUENCED

The main contextual variable that influenced competence requirements was the management level of the interviewees current position. Katz [10] defines an administrator (leader) as one who (a) directs the activities of other persons and (b) undertakes the responsibility for achieving certain objectives through these efforts. Even if an IQA is not in a line management position, one could argue they are (leading and) directing the actions of others. Who these might be would vary between lower-level management (e.g., members of own team, colleagues in the HIS department), middle level management (e.g., other managers in health information, finance and clinical services) and top-level management (e.g., senior managers, key stakeholders in the health system, financial controllers).

Katz's theory classically is that as one moves from lower management to top management, the emphasis shifts from requiring mostly technical and direct problem-solving skills to mostly applying conceptual and abstract thinking, along with high-level leadership. The findings of this study do not seem to fully support this theory for IQAs. In particular, the importance of technical skills, even if they might have evolved, seems to remain important at all levels of IQA management.

At the IQA middle management level, the increased requirements for greater human skills does provide more support for Katz's theory. Middle level IQAs seemingly need to develop and direct their communication skills into more focused actions like engaging stakeholders, actively negotiating, and leading and developing people around them.

At the IQA top management level, Katz's postulated greater need for more conceptual skills is only partly supported. However, one could argue that change management is such a large and all-encompassing area of competence that it is likely to be a dominant skill requirement that makes other human and even technical skill requirements subordinate. Another contextual factor influencing the IQA role and therefore the competence requirement that seemed to be important from the data was the interviewees' country (or geographic region) of work. There were differences between groups of interviewees from different countries, both in types of competencies required and also in how the competencies are applied. However, the number of interviews conducted was not sufficient to support a quantitative exploration of this issue to establish reliable patterns.

While it is tempting to hypothesise that any differences in IQA role across countries or regions relate to health system or cultural approach differences, a more likely and potentially more precise theory is that the key influencing factor on IQA role differences is the level of data maturity of the context in which they operate. Thus, it might be conjectured that a

context (country, region, hospital) where data maturity is high will require an IQA to possess more strategic conceptual skills and competencies to facilitate better collaboration between (already existing) technical capabilities. In a context where data maturity is low, an IQA, even in a top management role, will be required to possess and use technical competencies more and supplement these competencies with human skills that can harness the full potential of the team whose members contribute to the quality of the data.

STRENGTH AND LIMITATIONS

This study has three strengths. Transferability was addressed by recruiting a diverse sample of IQAs from various countries and healthcare contexts. Dependability was achieved through detailed and transparent documentation of the research process. Confirmability was achieved by having multiple researchers independently review and verify the themes and competencies identified, ensuring that the findings were grounded in the data rather than researcher bias.

The main limitation is the small sample size. In order to achieve greater power in the cross-tabulations (for example by level of manager) a larger sample population spread more evenly across the management levels would have been beneficial. As noted elsewhere, a cross-tabulation by country (or digital maturity) was precluded by the small number of interviews.

CONCLUSION

Our sample size is small and based on health sector contacts in a comparatively limited number of countries, so our conclusions are somewhat tentative. Nevertheless, the insights supplied by the interviewees contribute to an emerging understanding of the competencies required to carry out this role. The competency requirements are influenced by the context in which people work including the management level of their current position. The detail of the conceptual, human, technical skills may provide a useful guide for new entrants to the IQA role, for those wishing to advance their career and as a benchmark for IQA capability assessment.

In an earlier paper [7], we proposed that more training and support for people to fill the IQA role is critical to improving the quality of the data. This study has confirmed the need for such training and validated the key competencies of IQAs that need to be developed. However, training content and approaches need to account for variation in learner needs based on their level of career progression and the data maturity of the system within which they work.

To build a cohort of IQAs, the training needs to be appropriate (comprehensive attainment of relevant learning outcomes), and effective (delivering learning outcomes as quickly as possible and for the least cost). Training options will therefore need to be highly flexible and able to be packaged in modules that can be accessed when appropriate. Because of this, it is unlikely a single, all-encompassing course intervention will be efficient. An initial focus on the development of 4-5 key modules (probably non-technical because this will be a strength of most IQAs) would seem appropriate.

Further work could explore the relationship between the data maturity context and IQA competence needs. This will require a means of classifying data maturity. There are a number of methods available (see Carvalho, et al., [12]), some of the most popular being the Global Digital Health Index Indicator Guide [13], Informatics Capability Maturity Model [14], Health Information System Stages of Continuous Improvement Toolkit [15]. A composite of these was recently created specifically for Pacific Island Countries [16]. From a practical perspective it is perhaps safest to employ the World Health Organisation's SCORE tool [17], since this has already been used to rate 133 countries in their level of data maturity.

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APPENDIX A: INFORMATION QUALITY ADVOCATE INTERVIEW SCHEDULE

Name of Interviewee	
Organisation	
Position description	
Country	
Contact details in case of any need to follow up to clarify content	

BACKGROUND

We, the proponents of this research, hypothesize the need for a role within the health workforce of an information quality advocate (IQA) to facilitate the necessary structural and process changes to ensure sustained quality of collected data. We have published on this role and proposed a set of competencies required for this role. If you are interested, we can send you our previously published research.

This study will build on the earlier work to:

- (1) Further understand specific competency needs in different settings believed critical to IQA performance
- (2) Explore the facilitators and barriers to successful deployment of IQAs in real world environments.

The research will conduct interviews with between 20 and 30 individuals in different data collection contexts and countries. You have been identified for interview by a member of the research team or an associate because it is believed you are already playing the role of an IQA (even if not specifically identified as such) or could potentially be playing that role. You may also be someone who uses data/information for decision-making and has an interest in ensuring that the information you use is timely and accurate.

Participation in this interview is voluntary. If you wish to stop the interview at any point, please just let us know and we will cease the interview. **Are you happy to proceed with the interview?**

Also, I would like to record today's session, with your permission, and I'll also take some notes throughout. The notes and recording will be destroyed once we have analysed the data from all the interviews we do. We won't use any names or identifiable information in our report - confidentiality will be maintained.

CAREER HISTORY

Question 1

What are your qualifications and in what year did you obtain the qualifications?

Qualifications	Year obtained

What is your current position (prompt: official title)? How long have you been in your current position? Can you describe the role briefly in terms of key duties / tasks? How does data quality impact on your role?

What skills and knowledge (competencies) did you have to develop, either to gain your current job or to learn on the job, to perform it adequately once appointed?

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Question 2

What job were you doing immediately prior to this job? Did it have a focus on data quality ... please describe the job? What prompted you to seek that job?

What skills and knowledge (competencies) did you have to develop, either prior to gaining this job or after being appointed, to perform it adequately?

Question 3

Repeat the above questions to gain insight into the career history, tracing back job changes until the career change that initiated a strong focus on data quality.

Question 4

How did you come to take an interest in data/information quality?

CRITICAL INCIDENT TECHNIQUE

Note for interviewers“ ...

By **an incident** is meant any specifiable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act. To be critical the incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects^[11]."

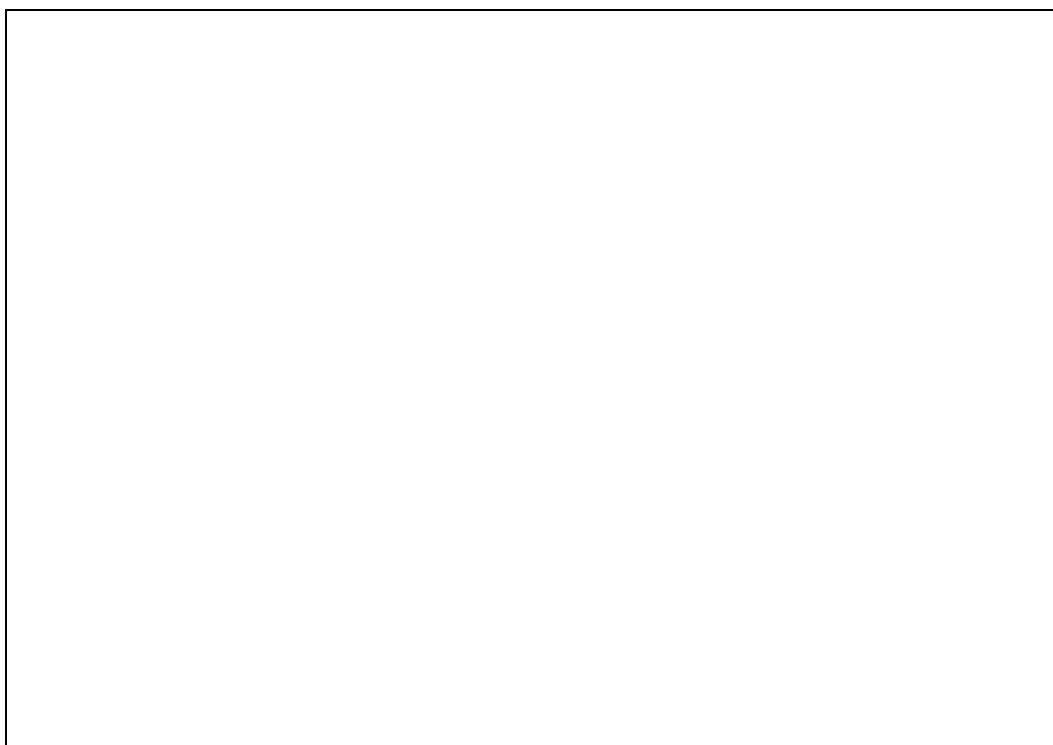
Question 5

I want you to think about a critical incident that you were either involved in or observed as a third party. A critical incident could be a decision, introduction of a new process or procedure, a manager's or worker's behaviour, that you felt clearly impacted quality data outcomes (positively or negatively). The incident might be short term / immediate or longer term. It could have happened in the last 12 months or further back.

An example of a critical incident might be the adoption of a new policy by a specialist doctor to review discharge notes for all junior doctors (interns, registrars) in a hospital department which led to significantly improved details and specificity in the discharge notes available to clinical coders.

Probe options:

- Can you describe the incident?
- What led to or prompted the particular situation or incident?
- How was it able to be considered 'critical'?
- What was the impact on data quality in response to the incident?



Question 6

What were the key competencies (skills and knowledge) that were engaged in the response? Or should have been engaged in order to obtain a better data quality outcome?

Probe options:

- What were the competencies employed that created an improved data quality outcome?
- Alternatively, what competencies (skills, knowledge, attitude) were lacking that might have averted negative consequences?

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Repeat these questions for each incident the interview subject can remember and describe.

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Question 7

Thinking back on all of the incidents you have described, can you list the top four competencies you think are required to improve and maintain high data quality?

[1] Flanagan, J. C. Critical incident technique. *Psychological Bulletin*, Vol. 51, No. 4, July 1954

THE EFFECT OF PERSON-ORGANIZATION FIT ON JOB PERFORMANCE IN THE CONTEXT OF ORGANIZATIONAL CITIZENSHIP BEHAVIOR

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ABSTRACT

In healthcare institutions, employees who experience a strong alignment between their personal values and those of the organization are more likely to demonstrate organizational citizenship behaviors, which in turn contribute to enhanced job performance. The primary purpose of this study is to investigate the mediating role of organizational citizenship behaviors in the relationship between person–organization fit and job performance.

The research population consists of 530 employees working at Bayburt State Hospital, Türkiye as of 2023, and the sample includes 342 participants. The analysis results indicate that organizational citizenship behaviors have a direct and positive effect on job performance. Furthermore, the compatibility between the individual and the organization significantly and positively influences organizational citizenship behaviors. In addition, organizational citizenship behaviors are found to have a significant and positive impact on job performance. These findings highlight the important role that organizational citizenship behaviors play in enhancing employee performance. The results also reveal that organizational citizenship behaviors serve as a key mediating variable in the relationship between person–organization fit and job performance.

This study provides important insights for the development of employee management and performance improvement strategies in the healthcare sector. In particular, efforts to strengthen the alignment between employees and the organization may foster higher levels of organizational citizenship behaviors, which can, in turn, positively influence job performance. Implementing strategies that support person–organization compatibility and encourage organizational citizenship behaviors can effectively enhance both employee satisfaction and the overall performance of healthcare institutions. Such strategies are essential for achieving long-term success in the healthcare industry.

KEYWORDS

organizational citizenship behaviors; job performance; person-organization fit

INTRODUCTION

Hospitals in the service sector are labor-intensive enterprises with a complex organizational structure, where jobs are maintained through cooperation and teamwork. Employees in positions consisting of different specialties and occupational groups provide services in harmony with each other. For this reason, the continuity and effectiveness of health services depend on the ability of employees to fulfill their duties in cooperation, responsibility and information

sharing. Employees from different specialties and occupational groups provide services in harmony with each other. Therefore, the continuity and effectiveness of healthcare services depend on employees' ability to fulfill their duties through cooperation, responsibility, and information sharing. However, ensuring continuity and effectiveness in healthcare requires more than merely fulfilling job descriptions; employees must also contribute to the organization's functioning through voluntary efforts. In other words, it is important for employees to exhibit organizational citizenship behaviors (OCB) to achieve both individual and organizational goals. Recently, employees who only fulfill specified roles are considered insufficient in healthcare organizations, and preference is given to those who make extra-role efforts. This further emphasizes the importance of OCB. The concept of organizational citizenship behavior was first introduced by Dennis Organ et al. in 1983. Organ (1988) defined OCB as voluntary behaviors that individuals exhibit which are not formally recognized by reward systems but contribute to the organization's overall functioning [[1]. In line with this definition, OCB is based on volunteerism: it is encouraged but not mandated, and individuals who do not exhibit it face no sanctions. This requires individuals to be in harmony with their organization. Thus, employees with high person–organization fit (P–O fit) are more likely to demonstrate OCB, which leads to positive outcomes such as enhanced job performance (JP) and contributes to the organization's general functioning.

Harmony of the person–organization fit (P–O fit) refers to the similarities between the personal characteristics of the individual such as purpose, value, attitude and the characteristics of the organization such as purpose, norm, value and climate (2,3). This alignment enables employees to build better relationships with colleagues, adapt to organizational culture, and integrate into work groups, thereby strengthening their ties to the organization [[4]. In healthcare delivery, employees considered suitable for the organization tend to act as “good citizens.” Specifically employees with shared values and beliefs tend to exhibit voluntary help, empathy, and tolerance toward coworkers and others [[5]. The literature states that when P–O fit is high, OCB is also stronger [[6–9]. On the other hand, P–O fit can also increase the JP of employees. JP is defined as the extent to which an employee performs job duties according to established standards and includes many factors such as communication, empathy, cooperation, medical skills, and patient satisfaction [[10]. Healthcare JP directly affects not only individual success, but also the quality of healthcare services and patient satisfaction. Poor JP may lead to increased workload and higher costs for healthcare institutions [[10–12]. According to the P–O fit theory, employees who adapt well to their organizations are more likely to exhibit positive behaviors and attitudes such as longer tenure, job satisfaction, higher productivity, and enhanced JP [[13,14].

In high-stress and workload-intensive areas such as the healthcare industry, JP is considered a critical output for hospital workers. Effective and efficient performance of duties by employees is crucial for both individual and organizational success. Increasing JP depends not only on adherence to job descriptions but also on employees exhibiting OCB. OCB positively affects JP by increasing hospital efficiency through voluntary employee contributions. Several studies indicate that OCB enhances employee productivity, motivation, and JP [[14–17].

While P–O fit refers to the work of employees in accordance with the values and goals of the organization, the impact of this alignment on JP may occur not directly, but through OCB. In healthcare institutions, employees with high P–O fit tend to exhibit OCB more frequently, and these behaviors increase JP. This study considers OCB as a key mediating factor in the relationship between P–O fit and JP. The study aims to contribute to the literature by enhancing understanding of how P–O fit and OCB affect JP and to emphasize the significance of these relationships in the healthcare sector. What is the effect of person–organization fit on job performance within the context of organizational citizenship behavior? In this regard, the hypotheses of the study can be listed as follows:

H1: Person–organization fit (P–O fit) positively affects job performance (JP).

H2: Person–organization fit (P–O fit) positively affects organizational citizenship behaviors (OCB).

H3: Organizational citizenship behaviors (OCB) positively affect job performance (JP).

H4: Organizational citizenship behaviors (OCB) mediate the relationship between person–organization fit (P–O fit) and job performance (JP), such that P–O fit influences JP both directly and indirectly through OCB.

METHODS

POPULATION AND SAMPLE OF THE RESEARCH

The population of this study consists of 530 employees working at Bayburt State Hospital, Türkiye as of 2023. The questionnaire developed for the research was administered through both face-to-face and online methods. A sample size of 342 was deemed adequate for structural equation modeling (SEM), as the literature generally recommends a minimum sample size of 200, while samples above 300 provide more stable and reliable results [(18)]. The sample size was also confirmed using an online sample size calculator (www.surveysystem.com/sscalc.htm), ensuring sufficient statistical power for the analyses conducted.

DATA COLLECTION TOOLS

The questionnaire comprised four sections. The first section included six questions to determine participants' demographic characteristics. The second section used the Organizational Citizenship Behavior (OCB) scale developed by Podsakoff et al. (1990), consisting of 20 items across five factors. The OCB scale includes items such as "I help coworkers who have a heavy workload at work" and "I take time to assist colleagues who are experiencing work-related problems." The third section employed a one-factor, four-item scale developed by Netemeyer et al. (1997) to measure person–organization fit (P–O fit). The P–O Fit scale includes items such as "I believe my personal values are in harmony with those of the organization I work for" and "The values of my organization align with my beliefs about other people." The final section included a one-factor, four-item job performance (JP) scale created by Kirkman and Rosen (1999) and refined by Sigler and Pearson (2000). The JP scale includes items such as "I complete my tasks on time" and "I exceed my work goals." All items were rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). In order to ensure the validity and reliability of the scales, both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted. During EFA, items with cross-loadings above 0.40 or factor loadings below 0.50 were removed to ensure discriminant validity and item quality (Hair et al., 2010; Kline, 2023). The final model was confirmed with CFA, and model fit was evaluated using the indices CMIN/DF, GFI, CFI, NFI, TLI, and RMSEA. Each index provides different information about model fit: GFI (Goodness-of-Fit Index) indicates the proportion of variance in the estimated covariance explained by the model, with values above 0.90 indicating good fit. CFI (Comparative Fit Index) and NFI (Normed Fit Index) compare the fit of the target model to a null model, and values above 0.90 are considered acceptable. TLI (Tucker-Lewis Index) takes model complexity into account, with values above 0.90 indicating good fit. RMSEA (Root Mean Square Error of Approximation) measures the discrepancy per degree of freedom, and values below 0.08 are considered acceptable [(19–22)]. All indices for the final models were within acceptable ranges, supporting the adequacy of the measurement models.

ETHICAL ASPECT OF RESEARCH

Following the questionnaire's development, it was reviewed by the Bayburt University Ethics Committee, which confirmed compliance with ethical standards (Date: 26.05.2023; Decision No: 207/9). Subsequently, official permission was obtained from Bayburt State Hospital after approval by the institution's Scientific Research and Evaluation Commission.

RESULTS

EVALUATION OF DATA

The collected data were analyzed using SPSS and AMOS software packages. After explanatory and confirmatory factor analysis (EFA and CFA) were conducted prior to testing the theoretical model via structural equation modeling (SEM).

DESCRIPTIVE FINDINGS

Among the participants, 67.3% were female and 50.3% were married. The age distribution was as follows: 28.9% were between 18-24 years, 41.2% between 25-31 years, 15.5% between 32-38 years, 8.2% between 39-45 years, and 6.1% were

46 years or older. Regarding educational attainment, 2% had completed primary school, 9.6% high school, 40.1% associate degree, 43.6% bachelor's degree, and 4.7% graduate education. Occupational distribution indicated that 8.8% of participants were administrative personnel, 2.6% physicians, 33.6% nurses, 23.7% health technicians, 7.3% technical service employees, and 24% belonged to other occupational groups. Concerning professional experience, 20.2% had less than 1 year, 39.8% between 1-5 years, 18.1% between 6-10 years, and 21.9% more than 10 years in their respective professions.

FACTOR AND RELIABILITY ANALYSIS

EFA was initially performed on the OCB scale. Items 8 and 13 were removed due to cross-loading on multiple factors. Additionally, item 7 was excluded as its factor loading was below 0.5 in the confirmatory factor analysis (CFA). The resulting structure comprised 17 items across four factors, which were subsequently combined into a single second-order factor via CFA. For the P-O fit and JP scales, CFA confirmed the one-factor, four-item structure for each. After making necessary modifications, all scales demonstrated acceptable goodness-of-fit indices (see Table 1).

TABLE 1: FIT INDEX VALUES OF THE SCALES

Indexes	Reference Value	OCB	P-O Fit	JP
CMIN/DF	$0 < \chi^2/df \leq 5$	2.727	1.249	.016
GFI	>.90	.912	.998	1
CFI	>.90	.937	1	1
NFI	>.90	.904	.999	1
TLI	>.90	.922	.999	1
RMSEA	<.08	.071	.027	.000

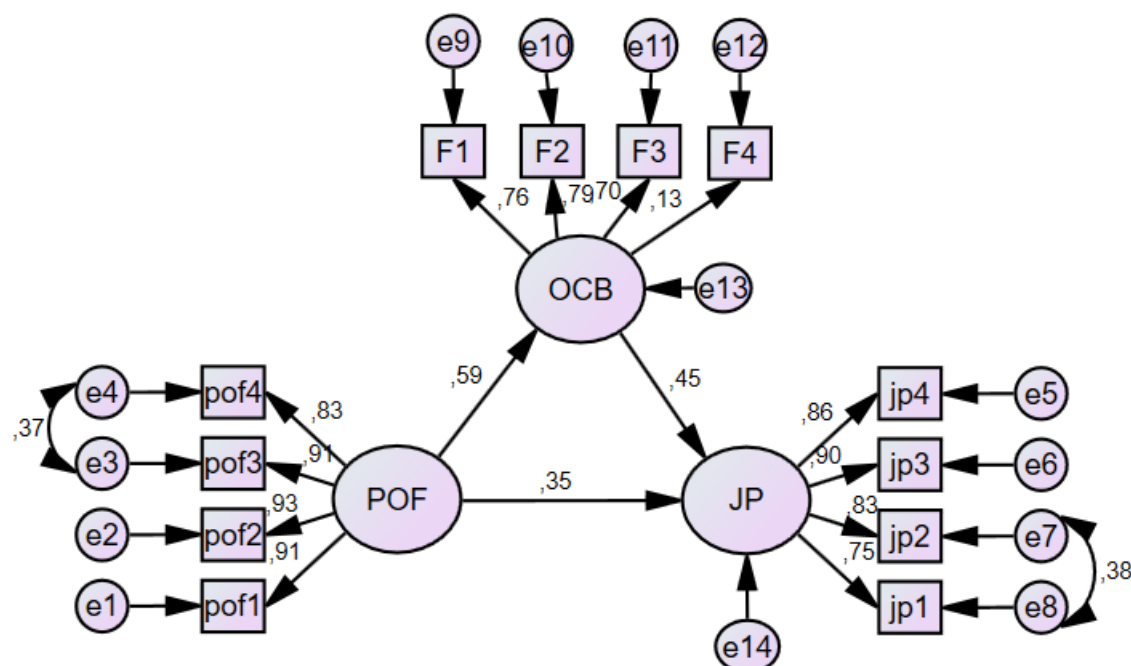
Cronbach's alpha coefficients were calculated to assess the reliability of the scales used in the study. The alpha values were found to be 0.858 for organizational citizenship behaviors (OCB), 0.945 for person-organization fit (P-O fit), and 0.910 for job performance (JP). Since Cronbach's alpha ranges from 0 to 1, with higher values indicating greater reliability (23), these results demonstrate that the scales employed in this study are reliable.

TESTING THE RESEARCH MODEL

To determine the mediating role of organizational citizenship behaviors (OCB), the direct relationship between person-organization fit (P-O fit) and job performance (JP) was first examined without including OCB. The effect of P-O fit on JP was found to be significant and positive ($\beta = 0.615$; $p < 0.001$). This indicates that P-O fit has a direct effect on JP.

The significance of the mediation effect was then assessed using the bootstrap method. The sample size was increased to 2000, and the bias-corrected bootstrap method, which provides a 95% confidence interval, was employed with a bootstrap factor of 1. The significance of the mediation effect was assessed using the bootstrap method, recommended for its robustness in testing indirect effects. A sample size of 2,000 was used to ensure stable confidence interval, and the bias-corrected percentile method was employed for accurate interval estimates. "Bootfactor 1" indicates the use of a single bootstrap factor in AMOS, testing the mediation effect with one mediator variable for precise evaluation. The prediction and mediation results of the model are illustrated in Figure 1. Furthermore, the model demonstrated acceptable goodness-of-fit indices (CMIN/DF = 2.190; GFI = 0.951; CFI = 0.980; NFI = 0.965; TLI = 0.973; RMSEA = 0.059), indicating that the model is appropriate for testing the mediation effect.

FIGURE 1: STANDARDIZED ESTIMATION RESULTS OF THE MEDIATION MODEL



During hypothesis testing, the model's prediction results are presented in Table 2. As shown, the effect of person–organization fit (P–O fit) on organizational citizenship behaviors (OCB) was significant and positive ($\beta = 0.587$, $p < 0.001$), indicating that P–O fit significantly influences OCB. Furthermore, the effect of OCB on job performance (JP) was also significant and positive ($\beta = 0.454$, $p < 0.001$), demonstrating that OCB plays a crucial role in enhancing JP.

TABLE 2: ESTIMATION RESULTS OF THE STRUCTURAL MODEL

Predicted Variable	Predictor Variable	Standardized Regression Weights	S.E.	C.R.	p
OCB	POF	.587	.037	9.560	***
JP	OCB	.454	.087	6.503	***
JP	POF	.348	.047	5.676	***

*** $p < 0.001$

The analysis results indicate that the direct effect of person–organization fit (P–O fit) on job performance (JP) decreased with the inclusion of organizational citizenship behaviors (OCB) in the model ($\beta = 0.348$, $p < 0.001$), yet it remained statistically significant. Additionally, the indirect effect of P–O fit on JP through OCB was also significant ($\beta = 0.266$, 95% confidence interval [0.159, 0.418], $p = 0.001$). These findings suggest that OCB partially mediates the relationship between P–O fit and JP. The significance of the indirect effect is further supported by the confidence interval not including zero. Overall, the results highlight OCB as a key mediating variable in the influence of P–O fit on JP.

DISCUSSION

The healthcare sector represents an exceptionally sensitive service domain that directly impacts human life. Unlike other industries, job performance (JP) within this sector is intrinsically linked not only to institutional efficiency but also to patient health outcomes and treatment efficacy. Insufficient JP may result in misdiagnoses, delayed treatments, and potentially fatal consequences. Therefore, the performance of healthcare professionals is paramount not only for organizational success but also for safeguarding public health.

The complexity of modern healthcare necessitates seamless coordination and collaboration among diverse specialties. Any decline in the job performance of a single healthcare professional can disrupt the entire continuum of care. Particularly in emergency scenarios, the capacity to make rapid and accurate decisions critically determines patient survival probabilities. Beyond enhancing patient satisfaction, high JP in healthcare settings produces tangible benefits such as reducing medical errors, shortening hospital stays, and preventing unnecessary readmissions. Hence, it is imperative for healthcare institutions to ensure that their workforce maintains elevated performance levels.

This study significantly advances the understanding of how person-organization fit (P–O fit) and organizational citizenship behaviors (OCB) interact to influence JP in healthcare contexts. The findings reveal that P–O fit exerts a direct and positive effect on job performance, underscoring the critical role of alignment between employees and organizational values, goals, and culture. Such alignment fosters greater employee commitment and motivation, which are foundational drivers of enhanced performance, as corroborated by extant literature [(24–26)].

Furthermore, organizational citizenship behaviors were found to have a significant and positive impact on JP. OCB encompasses discretionary employee actions that go beyond formal role requirements, promoting cooperation, teamwork, and proactive problem-solving—elements essential for elevating job performance in healthcare environments. This study also confirms that P–O fit positively influences OCB, indicating that individuals who perceive a strong congruence with their organization are more likely to engage in voluntary, constructive behaviors that support organizational effectiveness [(27–29)].

Crucially, the mediating role of OCB between P–O fit and JP was substantiated using bootstrap analysis. The partial mediation effect indicates that while P–O fit directly enhances job performance, it also indirectly influences performance through the fostering of OCB. The attenuation of the direct effect upon including OCB in the model—though remaining significant—highlights the pivotal function of OCB as a mechanism through which person-organization congruence translates into improved employee performance.

In sum, this study contributes important theoretical and practical insights by elucidating the pathways through which P–O fit and OCB jointly facilitate superior job performance among healthcare professionals. The mediating role of OCB clarifies that employee alignment with organizational values not only boosts individual motivation but also stimulates discretionary behaviors that collectively enhance performance outcomes. Understanding these dynamics is vital for healthcare organizations aiming to optimize workforce management and, ultimately, patient care quality.

CONCLUSION

This study examined the relationships among person-organization fit (P–O fit), organizational citizenship behaviors (OCB), and job performance (JP) within the healthcare sector. The findings indicated that P–O fit has a direct and significant effect on JP, while OCB partially mediates this relationship. These results emphasize that alignment between employees and their organization is a critical driver of job performance, an effect which is further amplified through positive organizational citizenship behaviors.

From a practical standpoint, these insights carry important implications for healthcare management aiming to enhance workforce effectiveness and patient care quality. Specifically, healthcare organizations should prioritize recruitment and selection processes that assess and ensure strong P–O fit. This can be achieved by integrating value congruence assessments and realistic job previews into hiring protocols, helping to attract candidates whose personal values, attitudes, and work styles align closely with organizational culture.

In addition, healthcare institutions should cultivate a supportive work environment that actively encourages and rewards organizational citizenship behaviors. Implementing recognition programs that highlight voluntary, cooperative actions among staff can reinforce such behaviors. Training and development initiatives focusing on teamwork, communication,

and organizational commitment can further foster OCB. Managers and leaders play a pivotal role by modeling these behaviors and reinforcing a culture where discretionary efforts are valued and supported.

Moreover, regular organizational climate assessments can be used to monitor P–O fit and OCB levels, enabling timely interventions to address misalignment and disengagement. Promoting employee involvement in decision-making and organizational development can also strengthen their sense of belonging and commitment, which positively impacts JP. By embedding these strategies into human resource practices and organizational development plans, healthcare institutions can improve employee satisfaction, reduce turnover, and ultimately enhance patient outcomes through higher quality and safer care delivery. These approaches are not only vital for operational efficiency but also essential for sustaining long-term success in the increasingly complex and demanding healthcare environment.

Finally, while this study offers valuable insights within the healthcare context, further research across different sectors and with larger, more diverse samples is recommended to expand generalizability. Longitudinal studies could also provide a deeper understanding of the causal mechanisms linking P–O fit, OCB, and JP.

AUTHOR CONTRIBUTIONS

SK collected and analyzed the data and wrote the initial manuscript draft. RND conducted the relevant literature review. All authors contributed to study design, participant recruitment, and interpretation of the study. All authors read and approved the final manuscript.

FUNDING

This study did not receive any funding from organizations in the public, private, or not-for-profit sectors.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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FACTORS AFFECTING THE USAGE OF PACS IN TERTIARY CARE HOSPITALS IN INDIA: A CROSS-SECTIONAL ANALYSIS

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ABSTRACT

INTRODUCTION:

Picture archiving and communications systems (PACS) enable the electronic administration of digital image evaluation. PACS have been created in an attempt to provide cost-effective storage, quick image retrieval, access to photos taken using multiple modalities, and simultaneous access from various locations. The present study was conducted to identify and assess the various factors influencing PACS use among physicians and radiologists in multi-specialty tertiary care hospitals in Bengaluru, Karnataka, and defence hospitals across India.

METHODS:

A cross-sectional study was conducted between Feb-Sept 2024 among 219 physicians and 58 radiologists across nine hospitals (one private hospital and eight defence hospitals) in India. Three experts conducted face and content validation, and the questionnaire was suitably modified for use prior to data collection. Cronbach's alpha was used to assess internal consistency. Data was collected using a questionnaire, either through paper or Google Forms. Descriptive statistics, ANOVA and Pearson's correlation were performed.

RESULTS:

The benefits most frequently reported by clinicians and radiologists were improved patient care, adequate image quality, and the more frequent use of PACS for prior examinations. Concerns regarding perceived challenges include the unavailability of images at the bedside, downtime exceeding acceptable levels, and inadequate training. Significant relationships and variance were found between user characteristics and interrelated variables. Utilisation rates of radiological equipment differ due to the challenges identified.

CONCLUSION:

The study helps to identify and analyse both the benefits and challenges of PACS usage among physicians and radiologists at private and defence hospitals in India. The findings of this study provide an initial assessment of the radiology department's management strategies regarding the impact of PACS on its users.

KEYWORDS

Picture Archiving and Communication System (PACS), radiologist, physician, patient care delivery, India

INTRODUCTION

Picture archiving and communications systems (PACS) enable the interelectronic administration of obtained digital image evaluation. Pipelining to boost the performance of the central processing unit, client and server design for remote radiology applications, and image file servers are all examples of computer architecture that may be used in radiology. Image compression methods improve digital storage and image transmission rates. Identifying bottlenecks can help boost throughput rates [1]. PACS have been created in an attempt to provide cost-effective storage, quick image retrieval, access to photos taken using several modalities, and simultaneous access at many places. PACS can accept input from both digital and analog sources (when the latter have been digitized). PACS is generally composed of an image capture device (an electronic gateway to the system), a data management system (a specialized computer system that manages the flow of information on the network), and image storage devices, A transmission network (which serves local or vast regions), display stations (which contain a computer, text monitor, picture monitors, and a user interface), and equipment for producing hard-copy images (currently a multiformat or laser camera). The aims of PACS are to increase operating efficiency while preserving or increasing diagnostic capability [2].

Purchasing and implementing a PACS is a significant investment with long-term implications for healthcare providers. Consideration of selection variables is crucial for ensuring customer pleasure and quality. Mistakes in decision-making can have negative consequences for a company. Effective decision-making is crucial in healthcare institutions like hospitals to ensure high-quality patient care. Inadequate PACS features can result in medical blunders and jeopardize patient safety [3]. In many industrialized nations, this technology is well-established, and its implications are well recognized. However, in developing nations like India, its application is still in its infancy. The advantages of this technology are not fully recognized. Indicators that may be assessed include the impact of this system on reporting times and the percentage of imaging services used [4].

The areas most impacted by the switch to filmless imaging in radiography examination execution are data access, picture acquisition, and repeating lost exams. It has been demonstrated that there is a significant reduction in the report-generating time (known as the report turnaround time), which is calculated from the conclusion of the examination to the delivery of the film and report. PACS influences report transcription and report dictation times. In one research, the average turnaround time decreased from 87.8 to 32.3 hours, and 71.1% of the reports were available within 24 hours [5]. PACS, traditionally utilised in radiology, has expanded to include medical images from cardiology, oncology, and dermatology. PACS is widely used in hospitals worldwide to enhance patient care. Barriers to using the technology include staff reluctance, downtime, and insufficient training [6,7,8].

Several studies have sought to illustrate the benefits of PACS to users, although many have focused on specific categories of users, such as radiology trainees, users in a particular department, or have been more specialised in their approach [9,10]. Previously published articles have outlined factors recognised during the selection process and critical success factors for implementing PACS in hospitals. During the selection phase, they categorised factors into two categories: specific factors and general factors. Specific factors include usability, leveraging the experiences of leading centres in PACS implementation, interoperability, specialised capabilities for education and research, and compatible hardware. In general, factors include price, domestic or foreign software, vendor presentation, quality, systemic factors, and management factors [3,9,10]. Published articles highlight factors affecting physicians and radiology staff; and have identified and analysed the benefits, such as improved patient care, reduced time for reviewing an exam, better consultation efficiency and challenges of PACS for the participants in their study and improved diagnosis accuracy [11,12, 13].

Several research gaps remain regarding the implementation of PACS in hospitals. Most of the studies identified were conducted after the implementation of PACS; therefore, there is a need for pre- and post-studies to be conducted to fully assess the efficiency of PACS. There is also a need to compare the outcomes of PACS across different working environments [6,12, 14]. A scoring system based on a set of criteria is needed to select the PACS with a higher score, which

leads to patient's satisfaction and better efficiency [6, 12]. Previous literature did not consider socioeconomic and cultural variables [11, 15]. Recent literature mentions various quantitative and qualitative factors that significantly affect the use of PACS in hospitals [6,12, 14]. The present study was conducted to identify and assess the multiple factors affecting PACS use among physicians and radiologists across multi-speciality tertiary care hospitals in Bengaluru, Karnataka and defence hospitals in India.

METHODS

This cross-sectional study was conducted among physicians and radiologists in a multispecialty tertiary care hospital in Bengaluru, Karnataka, India, as well as in defence hospitals across the country. Cross-sectional studies are effective for this study because they collect data from a representative sample, providing an overview of the topic under investigation. Furthermore, this technique is suitable for examining the relationships between sociodemographic traits, service outcomes, and personal intentions and hassles [16].

Data collection was conducted in two phases; Phase I was conducted in a multi-speciality hospital in Bangalore between Feb-Mar 2024 with 63 physicians and eight radiologists interviewed face-to-face, and Phase II was conducted across multiple defence hospitals across India between Aug-Sep 2024, with 156 physicians and 50 radiologists contacted for interviews across eight hospitals in the country. Consent was obtained verbally over the phone for personnel who were not physically available, and the call logs and phone numbers were recorded. Google Forms were circulated, and the questionnaire PDF was sent; completion was done at the subject's convenience. Personnel who were available on-site consented directly. Due to security reasons, the exact locations of the defence hospitals cannot be disclosed. However, they were predominantly located in the northeastern and northern parts of India, with a few inputs from the southern military hospitals. Participants included both full-time and part-time physicians and radiologists with a minimum of 6 months of PACS usage experience. Visiting physicians or radiologists were excluded due to their presence in multiple hospitals, which limited their ability to respond to the use of PACS in the hospitals identified for the study.

INSTRUMENTATION

Step 1: Identification of multiple tools from previously published articles

Previous studies employed various tools to assess factors influencing PACS implementation in hospitals. For example, Saghabi et al. (2017) used an interview method to identify Critical Success Factors (CSFs) in PACS implementation [17], while Esfahani et al. (2018) employed a semi-structured interview in their qualitative study [3]. Goodarzi et al. (2016) used a previously validated questionnaire to measure acceptance levels in the emergency departments of three hospitals in Iran [18]. Buabbas et al. (2016) used a questionnaire and interview method to identify PACS impact on radiologists and technologists [19]. Tshalibe et al. (2023) conducted a cross-sectional observational study over five months using a questionnaire to measure both benefits and challenges of PACS from physicians' perspectives [12]. Aldosari et al. (2018) used a questionnaire for a quantitative study at the radiology department in a hospital in Saudi Arabia to examine the PACS impact from the user perspective [11]. Alalawi et al. (2016) used a questionnaire to assess perceived benefits and challenges for physicians and radiologists at three Ministry of Health hospitals in the Riyadh region, Saudi Arabia [14].

Step 2: Selection of appropriate data collection instruments

Studies conducted by Aldosari et al. (2018) and Alalawi et al. (2016) were conducted in the Riyadh region, Saudi Arabia, in a multi-speciality hospital, which is similar to the present study setting [11,14]. Tshalibe et al. (2023) and Alalawi et al. (2016) were more suitable and appropriate for my study, as both papers include benefits and challenging factors together [12,14].

Step 3: Validation of identified data collection instruments

Aldosari et al. (2018) utilised the Kaplan and Douch data collection instrument, as it was effective in a previous study [11]. The questionnaire was slightly modified and updated to accommodate the study conducted at King Abdul-Aziz Medical City. The instrument was later validated by four experts: two radiologists, a laboratory technologist, and a pharmacist with work experience in health information systems. After their feedback, some adjustments and rewording were subsequently made. Alalwai et. al. (2016) presented Cronbach alpha coefficient with moderate to high internal reliability and consistency; external communication (0.62), service outcomes (0.84), personal intentions (0.53), personal hassles (0.86), and increased blame (0.86)[14]:

The questionnaire used in Alalwai et al. (2016) was identified as the study instrument for this study. However, its face validity was low after internal discussion due to the many questions. Hence, it was decided that this data instrument would be shorted after discussion with the dissertation guide and further validated by experts (medical and IT) from the hospital. The data collection tool used for this study was validated by three experts and divided into three sections: Section 1: Five questions regarding socio-demographic factors; Section 2: Doctors intentions, further subdivided into 3-subscales: (A) Service outcome- 4 questions, (B) Personal intentions- 6 questions, (C) Patient care delivery- 2questions Section 3: Doctor hassles- 5 questions measured on a 5-point Likert scale and the data was collected through the questionnaire. The alpha coefficients of each variable of the original instrument are stated in Table 2.

Table 1: Alpha coefficients of each variable of the instrument

Subcategory	N of items	Alpha value (Physician)	N of items	Alpha value (Radiologist)
Service outcome	4	0.585	4	0.810
Patient care delivery	2	0.670	-	-
Personal intentions	6	0.723	7	0.651
Personal hassle	8	0.645	5	0.795

Data were collected using a questionnaire, either in paper form or via Google Forms, for both participants, and were entered into MS Excel with unique identification numbers and codes. Data was saved on a password-protected personal computer. Data files are stored in the Google Drive and are accessible only to research teams.

STATISTICAL ANALYSIS

All the data was organised using MS Excel and analysed using R software. Descriptive statistics were conducted and reported in frequencies and percentages in MS-Excel. Analysis of Variance (ANOVA) was performed to test the level of impact of the study variables (Service outcome, personal intentions, patient care delivery and personal hassle) on the user characteristics and Pearson's correlation test was conducted to examine the relationship between study impact variables by denoting the correlation coefficient as 'r' and the level of significance as 'p' in R software. All statistical significance was defined as $P < 0.05$.

RESULTS

In total, 219 physicians and 58 radiologists agreed to participate in interviews across nine hospitals in the country. 23.28% of physicians were between 30 and 35 years old, compared to 53.40% among radiologists. (Table 2). With the PACS experience, 37.9% of radiologists had more than 6 years of experience compared to 29.68% among physicians. Around 65% of the radiologists had less than 10 years of experience compared to 58% of physicians.

TABLE 2: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE POPULATION

Socio-demographic characteristics	Physician	Radiologist
Age	N, %	N, %
30 -35 years	51 (23.28%)	31 (53.40%)
36 -45 years	60 (27.39%)	9 (15.50%)
46 -55 years	50 (22.83%)	10 (17.24%)
Above 55 years	58 (26.48%)	8 (13.79%)
PACS Experience		
Below 1 years	22 (10.04%)	16 (27.58%)
1-3 years	66 (30.1%)	12 (20.68%)
4-6 years	66 (30.1%)	14 (24.1%)
More than 6 years	65 (29.68%)	22 (37.9%)
Years of Experience		
Below 5 years	50 (23.1%)	20 (34.48%)
6-10 years	77 (35.15%)	18 (31.0%)
11-15 years	70 (31.9%)	8 (13.79%)
15+ years	22 (10.04%)	12 (20.68%)
Total	219	58

Among physicians, 57.7% strongly agreed that PACS had reduced the time waiting for reviewing an image, and 3.2% strongly disagreed that PACS had reduced the turnaround time (Table 3). Regarding physicians' intentions, 20.5% agreed that PACS produce adequate image quality, and 54% strongly agreed that they access exams more frequently on PACS than on films. Among physicians, 60% strongly agree that PACS has improved their patient care delivery and its process. Among radiologists, service outcome 100% agreed that turnaround time had decreased after PACS implementation, and 87% agreed that PACS tools and functionality improve the quality of exam reports. 100% of radiologists agreed that PACS had reduced their time spent on locating exams for review and improved their quality in patient round (Table 4). 50% and 25% of radiologists agreed that they experience higher PACS downtime than acceptable and experience inadequate workstation speed.

TABLE 3: PHYSICIAN'S RESPONSES ACROSS VARIOUS DOMAINS

Service outcome	SA	MA	N	MD	SD	Mean	STD
PACS has reduced the time I must wait to review an exam/image	95 (57.7%)	49 (31.4%)	12 (7.7%)	2 (1.3%)	3 (1.9%)	4.42	0.839
I believe that report turnaround time has improved since the implementation of PACS.	55 (35.3%)	57 (36.5%)	34 (21.8%)	5 (3.2%)	5 (3.2%)	3.97	0.993
I believe that PACS tools and functionality improve the quality of the report.	66 (42.3%)	57 (36.5)	26 (16.3%)	4 (2.6%)	3 (1.9%)	4.00	.870
PACS has reduced the number of exams reordered because	61 (39.1%)	66 (42.3%)	22 (14.1%)	4 (2.6%)	3 (1.9%)	4.00	.870

the exams are not available (lost or located elsewhere) when I need them							
Total	277	229	94	15	14		
Personal intentions	SA	MA	N	MD	SD	Mean	SD
I access exams more frequently with PACS than I did with film	61 (57.7%)	49 (31.6%)	12 (7.7%)	2 (1.3%)	3 (1.9%)	4.42	.839
PACS has facilitated consultation between myself, other clinicians and/or radiologists at other healthcare locations	84 (53.8%)	45 (28.8%)	22 (14.2%)	2 (1.3%)	3 (0%)	4.32	.897
My efficiency has improved because of PACS.	46 (29.5%)	67 (42.9%)	34 (21.8%)	6 (3.8%)	3 (1.9%)	4.31	.897
PACS has reduced the amount time it takes me to access exams/reports	26 (41.2%)	29 (46%)	8 (12.7%)	0 (0%)	0 (0%)	4.3	.682
PACS produces adequate image quality on the hospital workstation	32 (20.5%)	79 (50.6%)	29 (18.6%)	9 (5.8%)	7 (4.5%)	3.77	0.986
Total	249	269	105	19	16		
Patient care delivery	SA	MA	N	MD	SD	Mean	SD
PACS has improved my ability to make decisions regarding patient care	49 (31.4%)	65 (41.7%)	38 (24.4%)	1 (0.6%)	5 (3.2%)	4.17	0.907
PACS meets my expectations for patient care delivery.	83 (53.2%)	44 (28.2%)	18 (4.76%)	6 (3.7%)	5 (3.2%)	4.24	1.015
Total	132	109	56	7	10		
Personal Hassle	SA	MA	N	MD	SD	Mean	SD
PACS have difficulty finding images when needed	3 (4.76%)	7 (11.1%)	7 (11.1%)	27 (42.8%)	19 (30.1%)	2.17	1.129
I experience inadequate workstation performance (speed)	3 (4.76%)	8 (12.7%)	10 (15.8%)	20 (31.7%)	22 (34.9%)	2.21	1.194
I have inadequate access to PACS viewing stations (PCs with Web or workstations).	1 (1.59%)	6 (9.52%)	12 (19.0%)	24 (38.1%)	20 (31.7%)	2.11	1.018

I have difficulty logging on to the system	0 (0%)	3 (4.76%)	5 (7.94%)	25 (39.6%)	30 (47.6%)	1.70	.816
PACS downtime is higher than acceptable	3 (4.76%)	2 (3.17%)	8 (12.7%)	19 (30.1%)	31 (49.2%)	1.84	1.081
I experience a lack of availability of system support	2 (3.17%)	0 (0%)	11 (17.4%)	19 (30.1%)	31 (49.2%)	1.78	.958
I received insufficient training in the new technology	6 (9.52%)	6 (9.52%)	12 (19%)	15 (23.8%)	24 (38.10%)	2.29	1.325
I am unable to view images at the patient's bedside	33 (52.38%)	12 (19.05%)	12 (19.05%)	4 (6.35%)	2 (3.17%)	4.11	1.123
Total	51	44	77	153	148		

SA- Strongly Agree, MA- Moderately Agree, N- Neutral, MD- Moderately Disagree, SD- Strongly Disagree and STD- Standard deviation

TABLE 4: RADIOLOGIST'S RESPONSES ACROSS VARIOUS DOMAINS

Service outcome	SA	MA	N	MD	SD	Mean	SD
I believe that report turnaround time has improved because of PACS.	19 (38%)	26 (52%)	4 (8%)	1 (2%)	0 (0%)	4.26	.687
PACS has reduced my professional travel time	38 (76%)	9 (18%)	2 (4%)	1 (2%)	0 (0%)	4.68	0.646
The implementation/installation from film to PACS was well managed.	3 (37.5%)	4 (50%)	1 (12.5%)	0 (0%)	0 (0%)	4.25	.707
The workflow is completely paperless and filmless after implementation of PACS	3 (37.5%)	2 (25%)	3 (37.5%)	0 (0%)	0 (0%)	4.00	.926
I believe that PACS tools and functionality improve the quality of my report.	23 (46%)	18 (36%)	8 (16%)	1 (2%)	0 (0%)	4.25	.707
Total	86	59	18	3	0		
Personal intention	SA	MA	N	MD	SD	Mean	SD
PACS has reduced the time I spend locating exams for review.	38 (76%)	9 (18%)	2 (4%)	1 (2%)	0 (0%)	4.68	.646
I access prior exams more frequently with PACS than I did with film	22 (44%)	22 (44%)	4 (8%)	2 (4%)	0 (0%)	4.28	.776

PACS has improved the quality of patient management rounds that I participate in.	5 (62.5%)	3 (37.5%)	0 (0%)	0 (0%)	0 (0%)	4.62	.518
Since the implementation of PACS the number of face-to-face consultations I have with physicians and other radiologists has decreased.	0 (0%)	2 (25%)	5 (62.5%)	1 (12.5%)	0 (0%)	3.13	.641
Since the implementation of PACS the number of phone (or other) consultations have with physicians and other radiologists has increased	1 (12.5%)	3 (37.5%)	4 (50%)	0 (0%)	0 (0%)	3.63	.744
PACS produces adequate image quality on the workstation.	16 (32%)	26 (52%)	6 (12.5%)	2 (25%)	0 (0%)	4.20	0.722
PACS produces adequate image functionality on the workstation.	16 (32%)	26 (52%)	6 (12.5%)	2 (25%)	0 (0%)	4.20	0.722
Total	98	91	27	8	0		
Personal Hassles	SA	MA	N	MD	SD	Mean	SD
I experience inadequate Workstation performance (speed).	2 (4%)	10 (20%)	15 (30%)	18 (36%)	5 (10%)	2.72	1.021
I have difficulty logging on to the System.	0 (0%)	8 (16%)	8 (16%)	24 (48%)	10 (20%)	2.28	.960
PACS downtime is higher than acceptable.	0 (0%)	14 (28%)	13 (26%)	14 (28%)	9 (18%)	2.64	1.073
I received insufficient training in the new technology.	2 (0%)	7 (14%)	18 (36%)	21 (42%)	2 (4%)	2.72	0.895
I experience a lack of availability of system support.	0 (0%)	1 (12.5%)	1 (12.5%)	3 (37.5%)	3 (37.5%)	2.00	1.069
Total	4	40	55	80	29		

SA- Strongly Agree, MA- Moderately Agree, N- Neutral, MD- Moderately Disagree, SD- Strongly Disagree and STD- Standard deviation

ANOVA analysis revealed significant variance between service outcome and personal hassle, as well as between the age of physicians and radiologists, respectively (Table 5). Years of experience showed significant variance among physicians in terms of personal hassle in physicians and radiologists. Significant variance was observed between service outcomes among physicians and personal intentions among radiologists with regard to years of experience (Table 5).

TABLE 5: ANOVA RESULTS OF PHYSICIANS AND RADIOLOGISTS

User characteristic s	Physicians								Radiologists							
	Service Outcome		Personal intentions		Patient care delivery		Personal hassle		Service Outcome		Personal intentions		Personal hassle			
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
Age	2.89	0.02	11.46	4.37	4.30	0.00	7.58	4.85	0.42	0.79	0.93	0.42	4.54	0.00		
Years of experience	2.12	0.09	2.91	0.03	0.81	0.48	5.03	0.00	0.82	0.47	0.87	0.45	2.28	0.07		
PACS experience	5.97	0.00	25.72	5.44	25.72	5.44	23.93	4.63	1.48	0.22	4.22	0.01	14.79	6.36		

Among physicians, age showed a strong, positive, and significant correlation with years of experience ($r = 0.883$, $p < 0.001$) (Table 6). Age showed a moderate positive correlation and high significance with PACS experience ($r = 0.605$, $p < 0.001$), but a moderate negative correlation with high significance for personal hassle ($r = -0.313$, $p = 0.012$). Experience with PACS showed a moderately significant correlation with personal hassle and patient care delivery, with significance ($r = 0.369$, $p = 0.003$) and ($r = 0.322$, $p = 0.010$). The service outcome showed a strong positive correlation and high significance with both personal intention ($r = 0.683$, $p < 0.001$) and patient care delivery ($r = 0.613$, $p < 0.001$). Personal intentions show a moderate positive correlation and high significance with patient care delivery ($r = 0.584$, $p < 0.001$) and a high negative correlation and significance with personal hassle ($r = -0.289$, $p = 0.022$). Patient care delivery showed a high negative correlation and some significance with personal hassle ($r = -0.246$, $p = 0.052$).

TABLE 6: PEARSON'S CORRELATION (PHYSICIANS)

Age	Age					
Years of Experience	r	0.883	Years of Experience	r	0.605	.645
	p	<.001	Experience with PACS	r	0.109	.031
Experience with PACS	p	<.001	Service Outcome	p	0.396	.809
Service Outcome	r	0.109	Personal Intentions	r	0.182	.105
	p	0.396		p	0.152	.412
Personal Intentions	r	0.182	Patient Care Delivery	r	0.126	.090
	p	0.152		p	0.325	.485
Patient Care Delivery	r	0.126	Personal Hassle	r	-.313	-.149
	p	0.325		p	0.012	.244
Personal Hassle	r	-.313				
	p	0.012				

For radiologists, age showed a moderate to high correlation with other variables, but a negative correlation with personal hassle, and a significant p-value with years of experience ($r = 0.909$, $p < 0.001$), PACS experience ($r = 0.72017$, $p = 0.148$), and radiologist intentions ($r = 0.010$, $p = 0.859$) (Table 7). PACS experience and years of experience with $r = 0.794$, $p < 0.019$ had a strong positive and significant correlation. The radiologist's intentions and years of experience showed no correlation ($r = 0.000$, $p = 0.997$). The radiologist's intentions and PACS experience, with a correlation coefficient of $r = 0.864$ and $p = 0.061$, showed a positive correlation. In contrast to the radiologists' hassle, it showed a negative correlation ($r = -0.312$, $p = 0.452$). Radiologists' intentions showed a negative correlation and significance ($r = -0.788$, $p = 0.020$) with regards to radiologists' hassles.

TABLE 7: PEARSON'S CORRELATION (RADIOLOGISTS)

Age	Age		Years of Experience		PACS Experience		Service Outcome		Radiologist Intentions	
Years of Experience	R	0.909	Years of Experience	0.136	PACS Experience	0.343	Service Outcome	0.599	Radiologist Intentions	0.666
	p	<.001								
PACS Experience	R	0.207	PACS Experience	0.343	Service Outcome	0.394	Radiologist Intentions	0.71	Radiologist Intentions	-0.788
	p	0.148								
Service Outcome	R	0.039	Service Outcome	0.145	Radiologist Intentions	0.394	Radiologist Intentions	0.71	Radiologist Intentions	-0.788
	p	0.574								
Radiologist Intentions	R	0.010	Radiologist Intentions	0.000	Radiologist Intentions	0.009	Radiologist Intentions	0.666	Radiologist Intentions	-0.788
	p	0.859								
Radiologist Hassles	R	-0.048	Radiologist Hassles	-0.097	Radiologist Hassles	0.061	Radiologist Hassles	-0.312	Radiologist Hassles	-0.788
	p	0.336								
Radiologist Hassles	R	-0.048	Radiologist Hassles	-0.097	Radiologist Hassles	0.061	Radiologist Hassles	-0.312	Radiologist Hassles	-0.788
	p	0.336								

DISCUSSION

Regarding the perceived benefits of PACS in terms of efficiency, 81% of the physicians agreed that PACS improved their efficiency; in contrast, 57.4% agreed in Alalawi [14]. 65% of physicians and 100% of radiologists agreed that PACS had reduced report turnaround time; in contrast, 98% of physicians agreed in Tshalibe (Tshalibe et al., 2023). 71% of physicians responded 'Agreed' to the inability to view images at the bedside, similar to 97% physicians in a previous study [12]. While this limitation could be a gap in the implementation plan, it must be analysed within the context of what is practical in the hospital setting of interest.

Although image quality assessment is subjective and dependent on the viewing platform, the majority of the respondents were satisfied with the image quality. Only 8% of respondents stated that their response was neutral, indicating that PACS produces inadequate image quality. In contrast, Tshalibe et al. (2023) reported that 2% of physicians agreed that PACS produces inadequate image quality [12]. The users' characteristics have shown a significant difference in terms of impact factors, such as personal intentions, patient care delivery, and personal hassle with physicians. Among radiologists' intentions show significant variance with user characteristics, similar to a previous study [11].

A significant positive correlation exists between service outcome and personal intentions, as well as between personal intentions and patient care among physicians. In contrast, a previous study found a significant negative correlation between personal hassle and service outcome [11]. Similar to Aldosari et al. (2018), among radiologists, personal intentions showed a significant correlation with user characteristics and service outcomes; in contrast, radiologists' hassles showed a negative relation with user characteristics [11].

As physicians received insufficient training (mean 2.29, SD 1.325), and radiologists experienced higher-than-acceptable PACS downtime (mean 3.38, SD 0.744), PACS utilisation rates differ (X-ray= 74.5%, ultrasound= 81.6%, C arm= 15.6%, CT scan= 35.7%, MRI= 25.2%, mobile x-ray=11%, mammogram= 12%). PACS/RIS training is a vital practical component that significantly impacts the long-term efficiency of PACS and the time it takes for the investment to yield a return. It is essential to start user training before PACS installation to ensure that productivity begins immediately from the first day [20]. With proper training of users, such as radiologists and physicians, PACS can demonstrate benefits in terms of time and cost savings over several years [21,22].

The results showed that factors such as age and experience with PACS, among physicians and radiologists, have a significant negative relationship with personal hassles. This opinion is likely related to the computer literacy level of the users and/or the lack of interoperability between PACS and other health information systems. Given the issues identified by the physicians and radiologists in our study, practical implications are needed to establish a comprehensive on-site training program, use online meetings for remote training, and utilise social networking sites to familiarise all personnel with

PACS system functions and to address downtime concerns, conduct a comprehensive investigation and find solutions, as these can be devastating to critical systems.

Furthermore, understanding and evaluating the challenges of implementing PACS in developing countries, such as India, is crucial. Finding suitable computer rooms that provide sufficient space for air conditioning, dependable power, and local networks presents additional difficulties, as the system relies heavily on stable electricity. Cultural barriers can also significantly hinder PACS deployment, especially in diverse healthcare environments. These barriers include language differences, varied communication styles, and differing perceptions of technology and workflow preferences [23]

The study has several strengths, such as the use of a validated questionnaire using face and content validation with moderate to high alpha coefficients across all domains, and the study is focused such as the use of a validated questionnaire using face and content validation with moderate to high alpha coefficients across all domains, and the study is focused on radiologists and physicians who primarily use PACS in hospitals.

A few limitations exist for this study. Since the investigation focused on radiologists and physicians, but did not include other medical professionals (e.g. surgeons) who receive patient reports and photographs. The study was confined to only one private hospital and defence hospitals in India. There is a definitive need for future studies to enhance the study's scope by including private and public hospitals, as well as rural and urban hospitals where PACSs are being used, for comparative purposes and to understand adoption challenges. Compared to the 219 physicians included in the survey, only 58 radiologists were available for interview. This was primarily due to the number of radiologists available in the interviewed healthcare facilities. As radiologists are primary users of PACS, future studies in India should focus on including a higher number of radiologists, with a particular emphasis on pre- and post-studies to identify the perceived benefits and challenges before and after the implementation of PACS.

CONCLUSION

Our study found that PACS users had positive perceptions of the system and its impact on their work routine among physicians and radiologists in India. However, overcoming barriers such as inadequate workspaces, insufficient power, and cultural barriers is crucial for its widespread adoption among physicians and radiologists in the country. Further research is needed across rural and urban hospitals, pre- and post-PACS adoption, and among radiologists for a comprehensive understanding of the barriers and challenges of PACS in India.

CONFLICT OF INTEREST:

None to declare

ETHICS APPROVAL:

The study has been approved by the Institutional Ethics Committee of MS Ramaiah University of Applied Sciences, Reference No: EC-24/92-PG-FLAHS

CONTRIBUTIONS:

GRR identified the topic, data collection, analysis, and draft write-up. AG conducted data collection and data analysis. DJ provided overall methodological guidance and final write-up. All authors reviewed and agreed on the final version of the manuscript. This publication is a component of the partial fulfilment of the Masters of Hospital Administration (MHA) dissertation fulfilment of GRR under the supervision of DJ.

DATA AVAILABILITY STATEMENT:

All data relevant to the study are included in the article or uploaded as supplementary information. All data that are incorporated into the article are available from the references mentioned. Raw data have been uploaded in the following link: 10.6084/m9.figshare.28107038

<https://figshare.com/account/items/28107038/edit>

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INVESTIGATING BLOCKCHAIN UTILIZATION CHALLENGES IN THE HEALTHCARE SYSTEM IN JORDAN

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ABSTRACT

Blockchain technology has emerged as a transformative innovation across multiple sectors, including finance, healthcare, agriculture, and real estate. Despite its widespread adoption, the healthcare system in Jordan has not yet leveraged blockchain for patient information storage, facing significant implementation challenges.

This study aims to investigate blockchain utilization challenges in Jordanian hospitals, clinics, and medical labs as doctors face challenges in verifying patient diagnostic conditions and accessing medical histories in the current off-chain systems. The study employed a mixed methodology to collect the required data from the study participants using a questionnaire survey and to confirm the study hypotheses with published studies. Data is collected from 100 participants, such as doctors, managers, nurses, consultants, and software developers. The collected data was analyzed using SPSS to investigate the challenges of utilizing blockchain in the healthcare industry.

The study findings revealed that security, privacy, reliability, and integrity help improve the healthcare industry in Jordan by storing and retrieving patients' histories for better treatment. In addition, these challenges are the main concerns of such technology in the healthcare industry in Jordan. Therefore, the study recommends utilizing such technologies in healthcare institutions for better diagnostics. Finally, the findings provide insights into the healthcare industry by examining the benefits of such technology in addressing such challenges.

KEYWORDS

blockchain, smart contract, healthcare, EHR, Jordan

INTRODUCTION

Today, blockchain technology is used in many applications including data management, financial services, cybersecurity, the Internet of Things, and the healthcare industry. Blockchain applications are attracting much attention to offer secure healthcare data and uphold patient privacy. Through the safe exchange of patient data and the encryption of such data using blockchain technology, the blockchain transforms conventional healthcare into a more dependable and accurate diagnosis and treatment. Additionally, blockchain utilization facilitates the doctors' understanding and storage of patient information [1]. Healthcare is a significant worldwide industry that contains personal and sensitive information that must be stored appropriately. This information should be accessible and utilized by authorized personnel for medical purposes.

Moreover, blockchain technology has gained significant traction across various industries, including healthcare, due to its potential to enhance security, privacy, and interoperability [71 - 74]. Many countries have explored blockchain applications in healthcare to secure electronic health records (EHR), streamline data sharing, and improve regulatory compliance. However, there has been limited research on blockchain adoption in Jordan's healthcare sector. Therefore, this study aims to bridge this gap by investigating the feasibility and challenges of implementing blockchain in Jordan's healthcare system.

Despite global advancements, Jordan presents a unique case for blockchain adoption in healthcare. The country's healthcare system is highly fragmented, comprising various government and private hospitals, each maintaining separate data management systems [3]. Unlike centralized models in some countries, this fragmentation poses significant challenges to implementing a unified blockchain-based system. Furthermore, awareness and understanding of blockchain technology among Jordanian healthcare professionals remain limited, creating additional adoption barriers. This study seeks to analyze the current landscape of blockchain in healthcare in Jordan, assess its potential benefits, and address the challenges specific to its implementation. By leveraging insights from international studies and contextualizing them within Jordan's unique healthcare infrastructure, this research aims to provide a comprehensive evaluation of blockchain's role in enhancing data security, reliability, and interoperability in Jordan's healthcare sector.

Blockchain deploys various techniques that help improve information storage, retrieval, protection, and safety. These techniques include electronic health records (EHR), decentralized networks, cryptographic techniques, smart contracts, and consensus mechanisms [2]. Furthermore, blockchain increases the healthcare industry's efficiency, reliability, and trust for all parties. This is because of the techniques used, such as distributed ledger technology (DLT) of transactions and a decentralized, immutable database that makes tracking assets and transaction data in a corporate network easier. A property may be physical [3] or mental [4]. Most users participating in the blockchain network must agree and provide their consent for a transaction to be recorded in the ledger [5].

The next section discusses the relevant studies of blockchain technology and the healthcare industry. Section 3 describes the research method. Section 4 presents the results, while Section 5 discusses the study results. Finally, section 6 outlines the study conclusion including limitations and future work.

BACKGROUND

BLOCKCHAIN TECHNOLOGY

A blockchain is a decentralized network of records or public ledger for all transactions that have taken place or digital events that have been exchanged between the involved parties in the blockchain. Most system users verify each transaction in the general ledger, and data cannot be deleted once entered. To make a simple and direct comparison, each transaction made is contained in a private, verifiable record on the blockchain. Instead of stealing files from a prominent site stored in a secure area, it is simpler to do so than to do it in a place where hundreds of people could witness your actions [6]. The word blockchain is derived from the "chain" of a group of "blocks" that contains information, where the block represents a network transaction and the "chain" refers to a group of "blocks". Each new "block" is added to a distributed ledger and verified by a group of network participants known as miners. the new transaction is attached to the end of the chain [7]. Blockchain is a distributed ledger technology (DLT) of transactions and a decentralized, immutable database that makes tracking assets and transaction data in a corporate network easier. A ledger consists of a chain of blocks, which allocates a block to a set of transactions. Each block includes a date and a hash function of the previous block to tie the blocks together. Block data integrity and non-denial are verified using the hash function [8]. Finally, blockchain is a database that only permits adding and changing its contents and maintains a comprehensive record of each addition and update. These operations are called "Transactions," and are applied to the database in batches called clusters. The blocks are connected because each block carries a hash of all the transactions from the preceding block [9].

HOW DOES BLOCKCHAIN WORK?

In buy and sell transactions, the seller records the sale as a credit, while the buyer debits their ledger. Both parties maintain ledgers to track activities. The buyer initiates the exchange by creating a blockchain block containing transaction details. This allows verification of funds transfer. Blocks form a chronological chain, serving as a permanent, accessible ledger. Blockchain is encrypted for integrity and extends beyond cryptocurrencies to various applications like copyright management, voting, and supply chain oversight. [10]. Eliminating the need for third-party validation and payment processing, blockchain technology reduces transaction costs and processing times. Additionally, it simplifies the maintenance of ledger systems as there are fewer systems to manage [11]. Miners play a crucial role in the blockchain network by finding, verifying, and adding new transactions. Transactions are validated using cryptographic keys, with the private key accessible only to the owner while the public key is visible to everyone on the network. Each transaction is signed with the appropriate key pair, preventing the reuse of coins. Once confirmed by miners, transactions are tamper-proof and irreversible. This characteristic was pioneered by Satoshi Nakamoto to ensure blockchain integrity. The information stored on the blockchain is accessible globally, eliminating the need for traditional transactions as all activities are tracked and recorded securely [12]. The Nakamoto Consensus Protocol governs blockchain operations by establishing rules for validating transactions, accepting new blocks, and selecting block paths, thus preventing redundancy. It distinguishes between global and local consensus methods. In the worldwide model, exemplified by Bitcoin, the genesis block is shared by all nodes, validating all transactions. Conversely, the regional model requires consensus only from participating users, reducing storage requirements and enhancing scalability. Nakamoto's consensus relies on proof-of-work (PoW), which is resource-intensive and challenging to quantify [13]. Since no central body monitors laws and regulations, proof-of-work ensures that each transaction validator acts honestly. Miners in blockchain networks play a critical role in maintaining consensus, ensuring all nodes have identical copies of the blockchain. This uniformity makes changes to previous blocks costly and challenging, as subsequent transactions must re-verify any modifications. Solving complex hash functions is a prerequisite for adding new blocks, with validators certifying the correct hash value. Successful miners receive Bitcoin and transaction fees, with higher fees prioritizing transactions. Peck likens introduced hash functions that identify one key for multiple locks, explaining the process as selecting the appropriate key and leaving it in place for confirmation by other network users [14], [15]. Figure 1 shows blockchain work behavior and Figure 2 represents the blocks of blockchain technology that consist of a decentralized database, data, and hash.

FIGURE 1: BLOCKCHAIN WORK BEHAVIOR

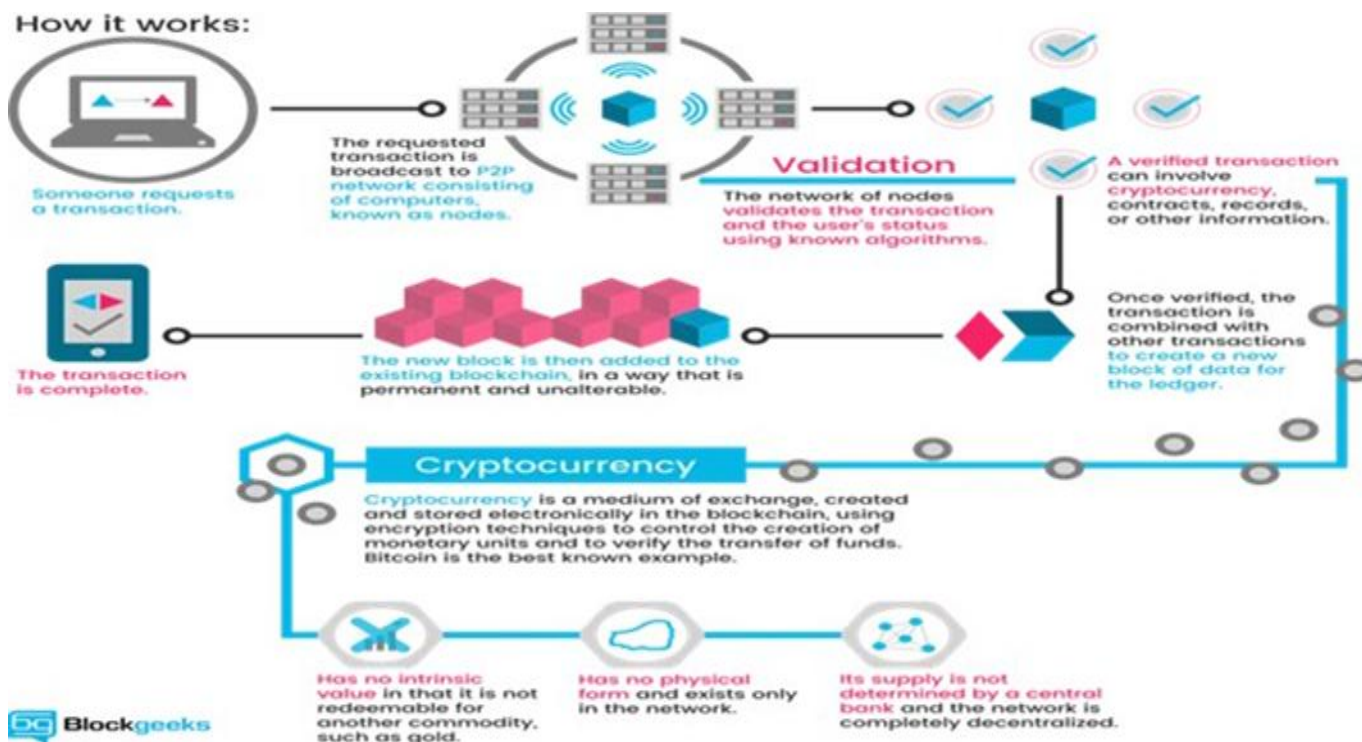
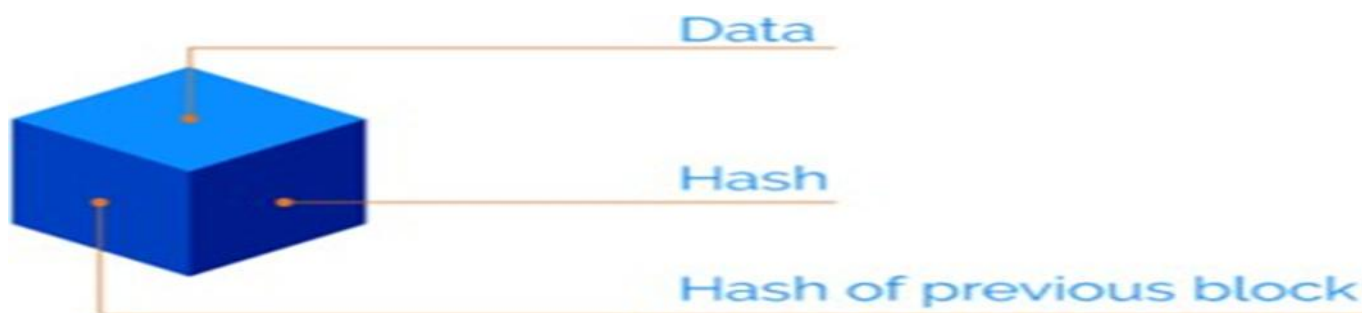


FIGURE 2: REPRESENTATION OF EACH BLOCK IN A BLOCKCHAIN



BLOCKCHAIN ELEMENTS

Blockchain technology consists of a decentralized network where each node holds a copy of a distributed ledger, ensuring transparency and eliminating a single point of failure. Transactions are secured through cryptographic techniques, making them immutable and tamper-proof. Consensus mechanisms like Proof-of-Work (PoW) and Proof-of-Stake (PoS) validate transactions and maintain integrity. In addition, Smart contracts enable automated, self-executing agreements without intermediaries. Blockchain protocols govern the creation and validation of blocks. The system balances transparency with anonymity, offering robust security features. Decentralized apps (DApps) take advantage of these properties to propose novel solutions to various industries [16, 17].

Decentralized Database: A decentralized database is data storage that is integral to blockchain-based systems, information is spread across multiple network participants to increase fault tolerance, reliability, and resistance to alteration. Blockchain utilizes distributed ledgers that are cryptographically secure, have centralized data storage, and lack authority. Consensuses like the PoW and the PoS authenticate and regulate transactions. Decentralized databases facilitate fast access from any node, which enhances security by preventing malicious attacks. They provide a powerful solution for secure, transparent, and decentralized data storage and management [18]. A unique aspect of blockchain-based healthcare systems is the concept of decentralized data management. This innovation promotes decentralized control over the data of patients, shifting the ownership of these data from institutions like hospitals or insurance companies to the patients themselves. Blockchain's cryptographic principles ensure the safe store, access, and sharing of patient's medical information. This paradigm shift promotes data privacy, transparency, and patient autonomy, all of which are responsible for empowering individuals to control their healthcare.

FIGURE 3: BLOCKCHAIN DECENTRALIZED DATABASE

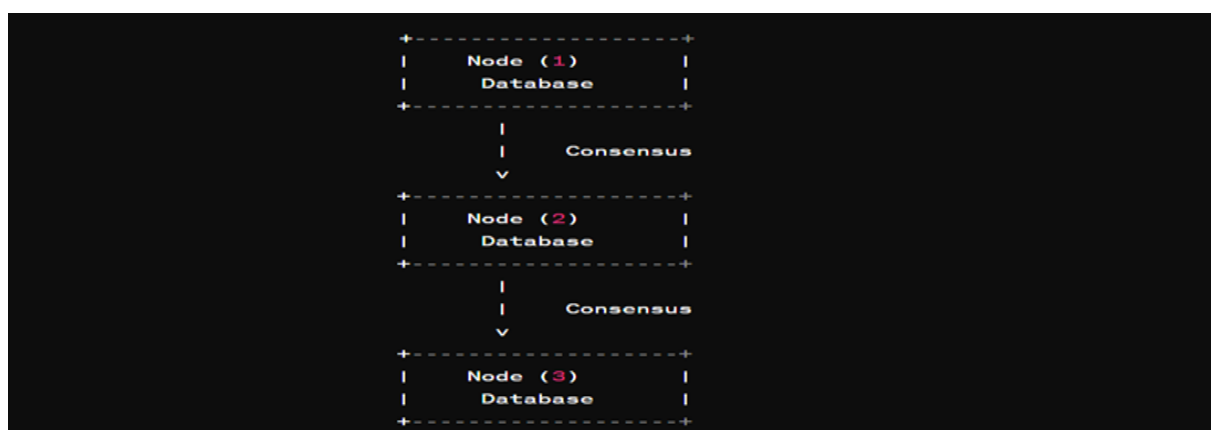


Figure 3 illustrates the decentralized database within a blockchain network. Each node represents a participant, storing a copy of the database. Arrows signify communication and consensus mechanisms, ensuring agreement on the database state. Transactions are validated and added to the database independently by each node, providing transparency and security [19].

- 1) Block: The block is the main nerve in blockchain technology, containing data related to many transactions. The blocks are linked with each other by mixing the previous block with the new block and surrounding it with a tight circle in the Blockchain [20].
- 2) Hash: A mathematical process known as hashing converts an input of any length into an encoded output of a given length. The hash is constant in size regardless of the original amount of data. Since hash functions are "one-way", they cannot be used to reverse engineer by taking the encrypted information out of the hashed output. However, if you apply the same function to the same data, the hash will be the same, allowing you to verify that the data is identical and correct. [23]

FIGURE 4: BLOCKCHAIN STRUCTURE

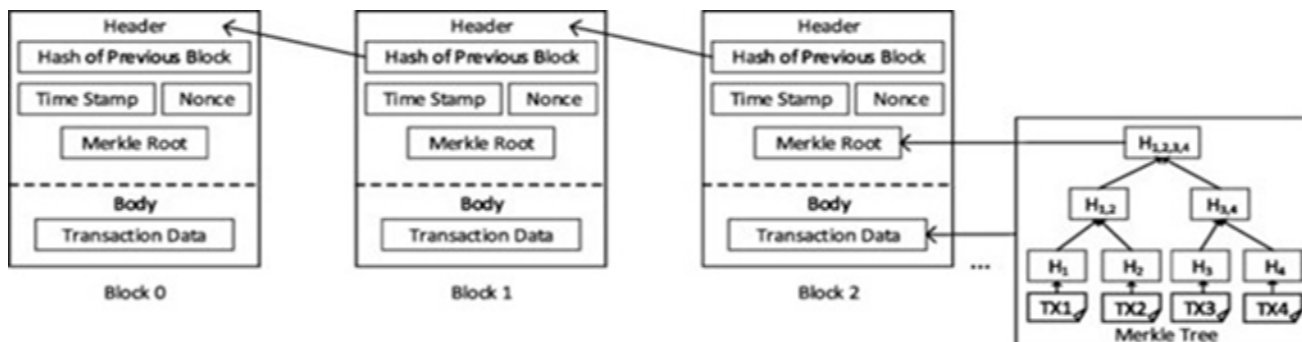


Figure 4 shows the structure of blockchain blocks, each block is divided into two parts, a header, and a body of transactions. The header contains the data description of the block containing all the details about the block in the blockchain [21]. The latest release to monitor program and protocol updates is among the fields in the block header. A timestamp, the number of transactions, and the block size are also included in the header. The hash value of the most recent block is displayed in the Merkle root field. In decentralized systems and P2P networks, Merkle tree hashing is frequently employed for effective data verification [22].

FIGURE 5: SHA-256 HASH FUNCTION

```

main.py
1 import hashlib
2
3 # Sample input data
4 data = "Ahmad, Aldalabeeh?"
5
6 # Compute the SHA-256 hash of the data
7 hash_object = hashlib.sha256(data.encode())
8 hash_hex = hash_object.hexdigest()
9
10 print(f"Fact data: {data}")
11 print(f"SHA-256 hash: {hash_object}")
12 print(f"SHA-256 hash: {hash_hex}")
13
Ln: 12, Col: 32
Run Share Command Line Arguments
Fact data: Ahmad, Aldalabeeh?
SHA-256 hash: <sha256 HASH object @ 0x7f91c1ba9b0>
SHA-256 hash: 9f626c65e97399f9be80a656c1fd6c16d00df396693b224a0a86d9a7de892ae6
** Process exited - Return Code: 0 **
Press Enter to exit terminal

```

Figure 5 shows the SHA-256 hash function, which produces a 256-bit hash and proves it by Python code. Hash functions are vital for maintaining the integrity and security of data in various applications, from simple data verification to complex cryptographic systems. Their deterministic, efficient, and secure nature makes them indispensable in modern computing.

- 3) Minor: A CPU that attempts to solve complex computational problems to discover a new block is known as a miner. As miners are a group of people who sit at a computer and work on blockchain applications to solve emerging

problems in the technology, miners can also work individually or in groups to try to find a solution to the mathematical problem [24].

- 4) Transaction: A transaction is a computational unit that implements and stores records in the blockchain after verifying user identity in the network. Blockchain allows users to review previous transactions at all times and prevent any changes [25].
- 5) Consensus Mechanism: Consensus mechanisms include proof-of-stake (POS) and Proof-of-Work (POW), which are important in authorizing, verifying, and managing transactions. For instance, PoS manages large-size transactions to control transaction costs and resource consumption. In addition, PoW manages the blocks that miners can add to the network [26].

BLOCKCHAIN TYPES

Blockchain is partitioned into three permission classes: public, private, and federated permission [27]. Public blockchain networks are accessible to anyone who wishes to add blocks allowing various transactions and information to be added. These commonly used blockchains are accessible. For example, Ethereum is a public network that enables miners to compete for Ether. Public blockchain networks have no privileges, which allows anyone to participate and verify transactions [28]. Furthermore, it utilizes consensus mechanisms like PoW or PoS to authenticate transactions. This is caused by the lack of a centralized authority that typically necessitates security measures implementations that require significant computational resources to prevent malicious users from affecting the system. While private blockchain systems, similar to federated chains, offer data-writing privileges to participants based on their performance and safety [74]. They excel in securely storing confidential data, particularly in applications like e-payment companies and online shopping sites such as Amazon and PayPal [29]. In contrast to public blockchains, private ones prioritize reliability and performance. Finally, federated blockchains, used by multiple organizations, share similarities with private blockchains, preserving transparency while facilitating transactions. These blockchains offer shorter transaction processing times but are not fully decentralized [30]. Federated blockchains are a type of blockchain where a consortium oversees the permissions. Based on how the blockchain was configured, the consortium nodes manage the decision and determine whether an operation is public or private [31, 32]. A brief comparison of these three types is represented in Table 1.

TABLE 1: COMPARISON OF PUBLIC, PRIVATE, AND FEDERATED BLOCKCHAIN ATTRIBUTES

Attributes	Public	Private	Federated
Consensus	All miners	One organization	The selected set of nodes
Consensus process	Permissionless	Permissioned	Permissioned
Read permission	Public	Can be restricted	Can be restricted
Immutability	difficult to modify	Could be tampered	Could be tampered
Efficiency	Low	High	High
Centralized	No	Yes	Partially

Table 1 presents a comparative analysis of the attributes of three distinct blockchain types: Public, Private, and Federated. The table elucidates six key attributes across these blockchain variants, offering insights into their operational characteristics and structural differences. The attribute "Consensus," delineates the entities responsible for achieving agreement within the network. In public blockchains, consensus involves all miners, while private blockchains restrict this to a single organization. Federated blockchains occupy a middle ground, with consensus determined by a selected set of nodes. The "Consensus process" row distinguishes between permission-less systems, characteristic of public blockchains, and permission systems that are employed in private and federated blockchains. "Read permission" refers to the accessibility of blockchain data. Public blockchains offer unrestricted access, whereas private and federated blockchains allow for potential restrictions on data visibility. The "Immutability" attribute addresses the resistance to modification of recorded data. Public blockchains are noted for their high resistance to alterations, while private and federated blockchains are potentially more susceptible to tampering. "Efficiency" compares the blockchain's operational speed

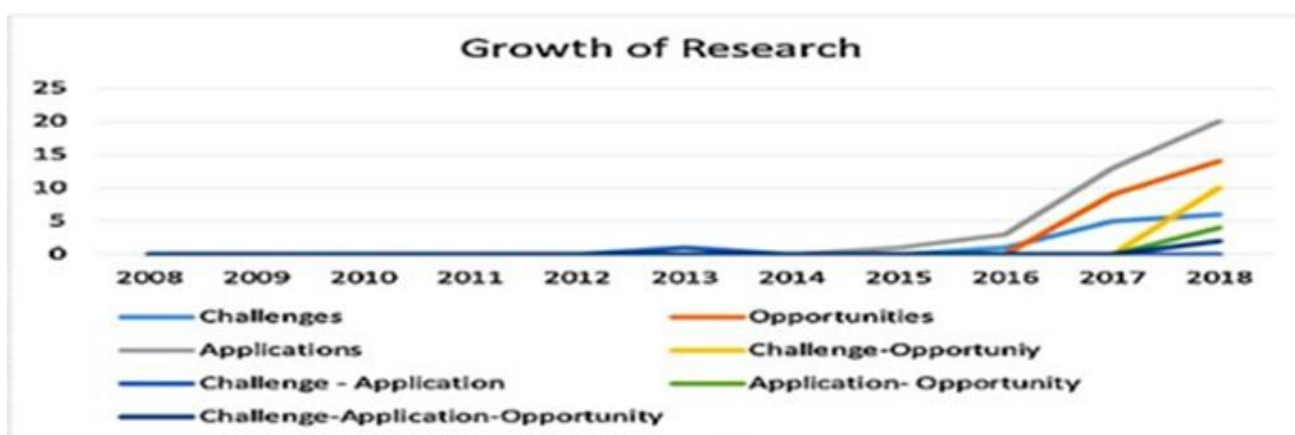
and resource utilization. Private and federated blockchains are categorized as highly efficient, in contrast to the lower efficiency of public blockchains. The final attribute, "Centralized," examines the degree of centralization in decision-making and control. Public blockchains are characterized as non-centralized, private blockchains as fully centralized, and federated blockchains as partially centralized. This comprehensive comparison provides a nuanced understanding of the trade-offs and design choices inherent in different blockchain architectures, facilitating informed decision-making in blockchain implementation and research.

BLOCKCHAIN CHALLENGES

Blockchain technology is one of the most advanced technologies that result in difficulties if combined because of the business need for clarity. Figure 6 shows that the blockchain has become valuable over the past years since its inception in 2008. Despite published research explaining this technology, it still lacks clarity and sufficient maturity to become approved by many companies securely [33]. Early adoption of modern technology like blockchain can lead to unforeseen challenges, such as high transaction costs, incompatible models, and uncertain operational expenses. Integrating blockchain with existing systems poses another challenge, as the blockchain must seamlessly extract information from necessary sources to function effectively [34]. Blockchain implementation confronts various challenges, with scalability being a primary concern. Current blockchain systems struggle to manage high transaction volumes per second (TPS) [35]. In addition, blockchains are susceptible to hacking and unauthorized access to sensitive information, which raises concerns about security and privacy [36]. Developing blockchain-based healthcare systems faces several barriers, including interoperability, security, privacy, reliability, integrity, scalability, and patient involvement. Ensuring communication between software applications developed by different suppliers or for various platforms is challenging without clear rules and standards. Further, cost of implementation and maintenance requires financial resources for infrastructure development.

However, transferring information between platforms like Ethereum and Hyperledger fabric complicates the development of remote patient monitoring applications [37]. Blockchain-based healthcare systems encounter scalability challenges due to the substantial data volume stored. Storing extensive personal information for diverse individuals can result in usability issues and impracticality. Additionally, blockchain processing mechanisms, such as Ethereum's verification process, involve participation from every network location leading to significant processing delays, especially during high data loads [38] as shown in Figure 6.

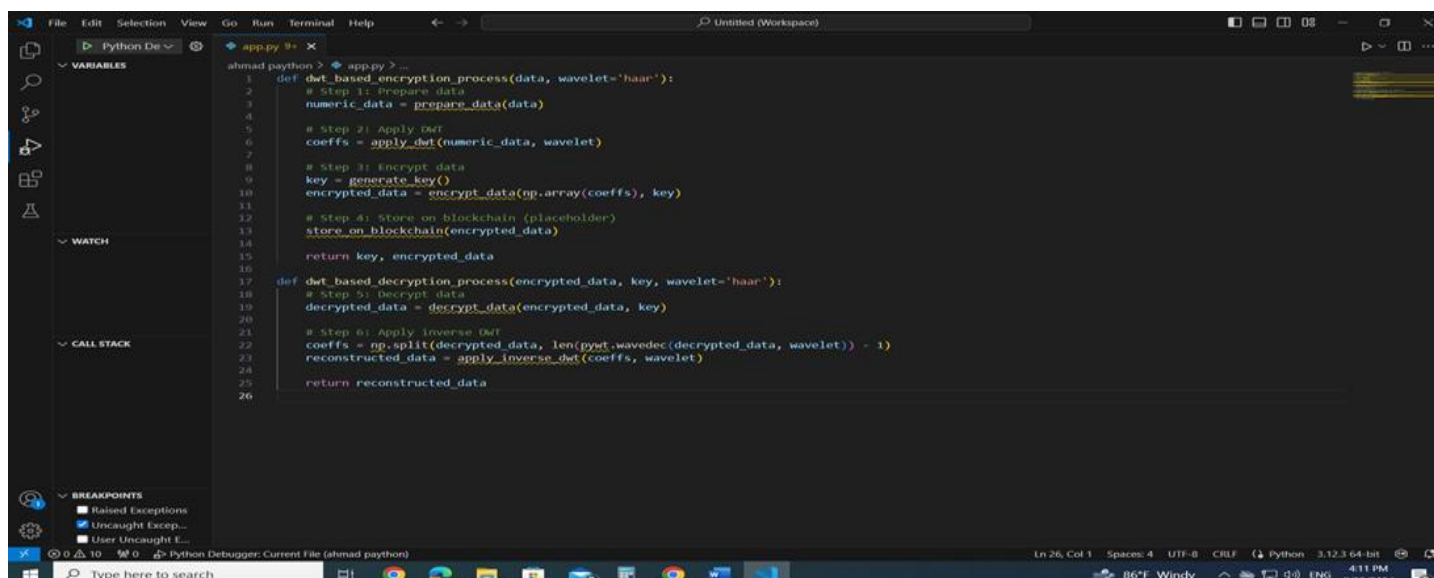
FIGURE 6: THE RAPID EXPANSION OF RESEARCH ON BLOCKCHAIN



DISCRETE WAVELET TRANSFORM (DWT)

(DWT) is a mathematical technique used to transform a signal or data set into a series of wavelets. Wavelets are functions that can represent data or other functions in terms of orthogonal basis functions. This transform provides both time and frequency information, making it useful for analyzing various data types, such as signals and images, which can be defined using Python code shown in Figure 7.

FIGURE 7: ALGORITHM FOR DWT-BASED ENCRYPTION



```

1  def dwt_based_encryption_process(data, wavelet='haar'):
2      # Step 1: Prepare data
3      numeric_data = prepare_data(data)
4
5      # Step 2: Apply Dwt
6      coeffs = apply_dwt(numeric_data, wavelet)
7
8      # Step 3: Encrypt data
9      key = generate_key()
10     encrypted_data = encrypt_data(np.array(coeffs), key)
11
12     # Step 4: Store on blockchain (placeholder)
13     store_on_blockchain(encrypted_data)
14
15     return key, encrypted_data
16
17 def dwt_based_decryption_process(encrypted_data, key, wavelet='haar'):
18     # Step 5: Decrypt data
19     decrypted_data = decrypt_data(encrypted_data, key)
20
21     # Step 6: Apply inverse Dwt
22     coeffs = np.split(decrypted_data, len(pywt.wavedec(decrypted_data, wavelet)) - 1)
23     reconstructed_data = apply_inverse_dwt(coeffs, wavelet)
24
25     return reconstructed_data
26

```

Figure 7 shows how to encrypt data within the blockchain, data encryption steps are explained by [39] as follows:

1. Function Declaration: Define the function (DWT) Based Encryption Process with parameters data, wavelet, and NumPy(np).
2. Data Preparation: Call prepare data(data) to convert the input data into a numeric format, storing the result in numeric data.
3. Apply DWT: Apply DWT [40] to transform the numeric data using the specified wavelet, storing the resulting coefficients.
4. Generate Key: Generate a cryptographic key by calling generate key () and storing it in the key.
5. Encrypt Data: Convert the wavelet coefficients to a NumPy array and store the result in the encrypted data.
6. Store on Blockchain: Securely store the encrypted data on a blockchain by calling the store on the blockchain.
7. Return Results: Return the cryptographic key and the encrypted data as a tuple.

BLOCKCHAIN-BASED HEALTHCARE

Healthcare is one of the world's largest and most important industries, providing essential services to individuals and communities. Germany spent 11.2% of the total gross domestic product (GDP) on healthcare in 2018, considered the third highest globally [41]. However, the industry faces several challenges that impact its ability to deliver high-quality, accessible, and affordable care. These challenges include high rates of fatness, an aging population, the Cost of healthcare, Pandemics (Corona pandemic) and global health emergencies, and shortages of healthcare professionals. The healthcare industry faces significant administrative challenges that divert resources from patient care signifying the need to explore innovative solutions to address these issues and support the evolving needs of patients and communities. Collaboration among policymakers, healthcare providers, and stakeholders is essential for developing and implementing effective solutions. This may involve investing in recruiting and training healthcare professionals, exploring new care delivery models like telemedicine and nurse-led care, and implementing measures to reduce administrative burden in healthcare [42]. Further, addressing lifestyle factors and promoting healthy living can reduce healthcare costs and improve health outcomes. According to Di Bonaventura et al. (2018), this entails employing policies and programs that encourage a healthy diet, boost physical exercise, and lower the prevalence of obesity and associated diseases. Developing solutions to fulfill the increasing need for healthcare services, especially for chronic illnesses that are more frequent among older persons, is crucial as the world's population ages [43]. Therefore, maintaining the integrity of technology in healthcare is essential for better communications. Electronic health records (EHRs), telemedicine, and other digital tools can facilitate better communication between medical practitioners, ease administrative burdens, and increase patient access to care. Telemedicine, for instance, can assist in addressing the scarcity of medical personnel

and make treatment more accessible to patients, especially in isolated or rural locations [44] [45]. These healthcare-based elements are shown in Figure 8.

FIGURE 8: BLOCKCHAIN-BASED HEALTHCARE COMPONENTS

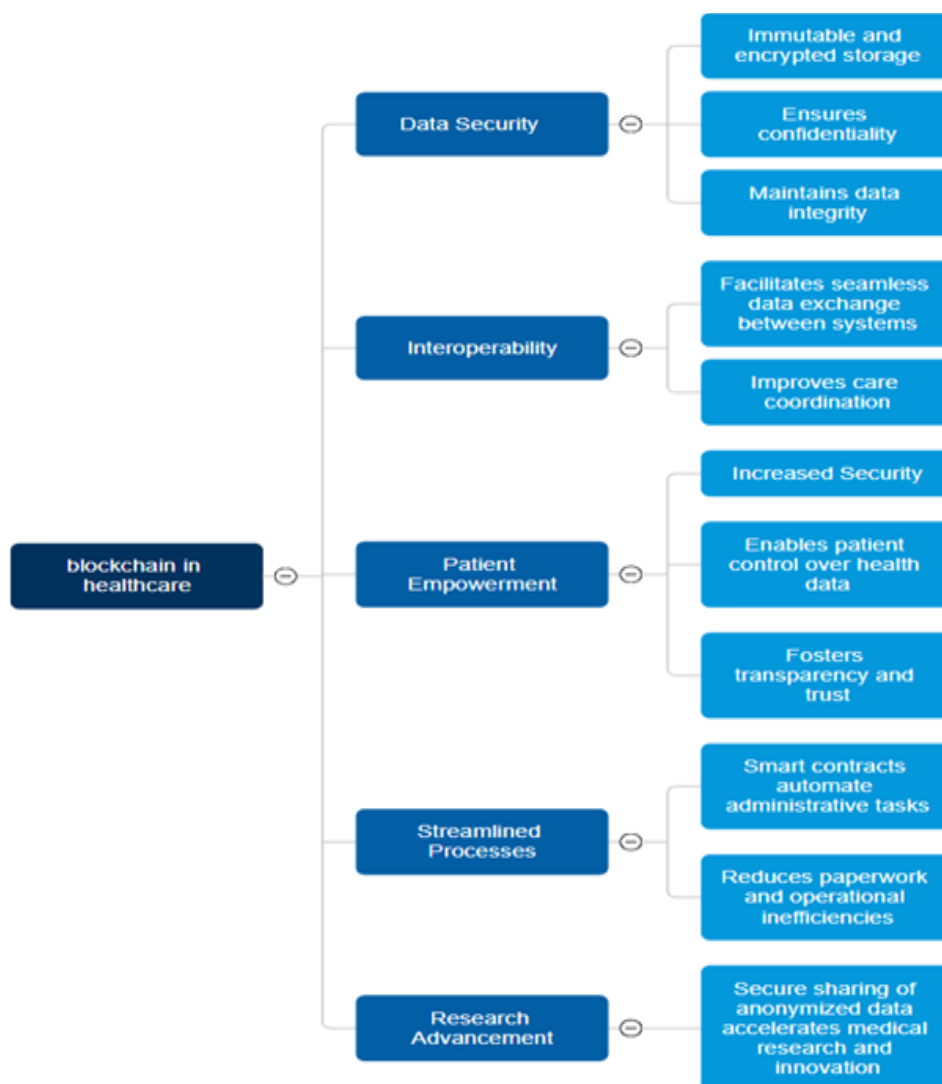


Figure 8 presents the different components of blockchain-based healthcare, including data protection, compatibility, patient information autonomy, reduced processes, and scientific research advancement.

HEALTHCARE DATA MANAGEMENT

Healthcare data management is crucial to ensure that data are used to enhance patient outcomes in healthcare, data must be maintained ethically. Thus, a full picture of a patient's records, treatment choices, and effective communication tools are all made available to medical professionals [46]. The relationship between blockchain technology and the General Data Protection Regulation (GDPR) is debated in Europe. However, blockchain appears compliant with the General Data Protection Regulation (GDPR) regarding data portability, such as tracking and legal auditing of how data is accessed and managed. Sharing data depends on reliable cooperation between the mutual parties during the operations process depending on the shared data and how they are shared [47]. Data privacy represents the ethical standards and laws that must be adhered to according to (HIPAA) and (GDPR) standards [48]. Therefore, most healthcare organizations adhere to such standards and rules to secure sensitive information using blockchain technology [49].

JORDAN DATA PROTECTION LAW

Jordan does not have a comprehensive data protection law equivalent to GDPR or HIPAA. However, there are some regulations and guidelines related to data privacy and security, such as the Electronic Transactions Law (2001) and the Cybercrime Law (2010). These laws provide some level of protection for personal data, but they are not as detailed or stringent as GDPR or HIPAA [74]. The lack of a comprehensive data protection law in Jordan could pose challenges for blockchain implementation, especially in terms of ensuring patient data privacy and security. Blockchain's decentralized nature might conflict with existing regulations that require data to be stored in centralized systems under the control of specific entities [52].

ELECTRONIC HEALTH RECORDS (EHR)

EHRs are cloud-based data storage used for healthcare records exchange between healthcare suppliers. Data exchange between suppliers raises security and trust risks of data attack and forgery [50], [51]. Blockchain technology manages EHRs effectively using different techniques to protect patients' information [52]. Thus, EHR is widely used in blockchain technology in healthcare. [53].

FIGURE 9: BLOCKCHAIN HEALTHCARE RECORDS

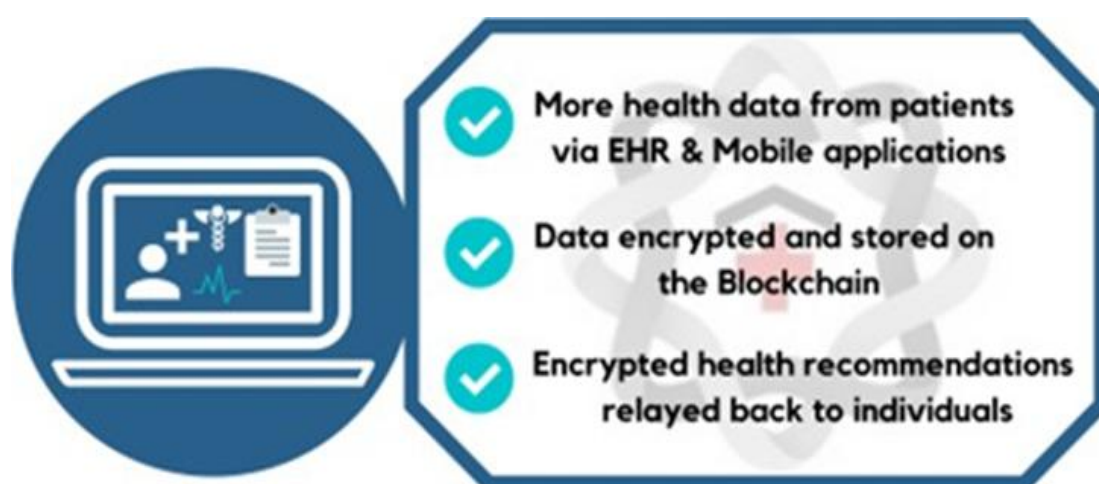


Figure 9 shows how patients' medical data are recorded in a digital domain called the Electronic Health Record (EHR). For example, the patient's general medical history, signs, symptoms, and historical illnesses are stored in the database. Each patient's electronic health records may include important data, such as a summary of their general health, administrative data, and legal paperwork [54, 55].

INTEROPERABILITY WITH EXISTING SYSTEMS

Jordan's healthcare system relies on a mix of public and private healthcare providers, each with its own electronic health record (EHR) systems. The lack of a unified regulatory framework for interoperability could hinder the integration of blockchain technology, which requires seamless data exchange between different systems emphasizes the importance of standardization in healthcare data management, which is currently lacking in Jordan [25, 27]. Without clear standards for data formats and protocols, integrating blockchain with existing EHR systems could be challenging.

REGULATORY UNCERTAINTY

Jordan, like many other countries, does not have specific regulations governing the use of blockchain technology in healthcare. This regulatory uncertainty could deter healthcare providers from adopting blockchain, as they may be unsure about compliance requirements [16]. Also, [48] suggests that regulatory clarity is essential for the successful implementation of blockchain in healthcare. If Jordan were to adopt GDPR-like regulations, it could create a more favorable environment for blockchain by providing clear guidelines on data protection and privacy.

DATA PRIVACY AND SECURITY IN BLOCKCHAIN

Blockchain technology utilizes tools to maintain data privacy and security which has arisen since using such technology in Bitcoins. Blockchain maintains Bitcoin data privacy and security through consistency, tamper-resistance, and resistance to a distributed denial-of-service (DDoS) attack. These features are still used by other sectors such as the Internet of Things (IoT) and healthcare [56]. Data privacy and security have many characteristics as follows:

Information Uniqueness

Information uniqueness indicates the lack of compatibility between two parties or two of the entities monitored for the system with excellent trust. Although blockchain technology verifies the provision of a false identity as a form of support to hide user identity, the user cannot be protected by using an anonymous name except by guaranteeing the user's pseudonym [57].

Confidentiality

Blockchain data privacy refers to the features of confidential sensitive data stored in the database. Although the blockchain was designed as a distribution system for digital currencies, it has become more widely used in applications such as smart contracts and copyrighted works. The security feature in digital currencies is not active, such as maintaining the confidentiality of the available amounts. Unfortunately, it is available to the public despite pseudonym use instead of the real identity. Even with the use of smart contracts in the Ethereum application, for example, when transferring an amount of money to another party, and the other party has information, this party may link this part of the information to its identity, so it requires the design of stronger protection mechanisms for contracts that maintain information privacy [58].

METHODOLOGY

This study utilized a mix of exploratory and survey methods to collect the required data to achieve the study aim by using a set of keywords from the available literature and the distributed questionnaire. Through this method, the problems related to utilizing blockchain technology in healthcare institutions in Jordan were investigated.

ETHICAL CLEARANCE

This study was conducted in accordance with the ethical standards and the National Health and Medical Research Council guidelines. Approval for the study was obtained from the Ministry of Health (MoH) in Jordan. All participants were informed about the purpose of the research, and informed consent was obtained before their involvement. The study ensured the confidentiality and anonymity of all participants, adhering to national and international ethical standards for research involving human subjects.

INSTRUMENT

The study hypotheses were tested based on the collected data from a questionnaire survey. The questionnaire was composed of constructs developed based on the extensive review of the published studies on healthcare and blockchain to ensure its validity and reliability. The distributed questionnaire was designed to assess the challenges used in the study. Questionnaire items were measured based on a five-point Likert scale, ranging from 1 (Strongly agree) to 5 (Strongly disagree)

SAMPLE AND PROCEDURE

This study was created to measure the use of blockchain technology in healthcare technology as a case study in Jordan, where 31 questions were used to address four potential challenges that the healthcare sector faces. The questionnaire was distributed based on the approval of the Ministry of Health to government hospitals, including Al-Bashir Hospital, and the private sector is represented by Hakeem Health Company and Health Laboratories such as Biolab, and Med Labs. Also, it was distributed to professionals such as doctors, software developers, and nurses. The total of the distributed questionnaires was 120 samples. 100 valid responses were obtained and considered valid for analysis, where 40 samples were omitted from the study due to incomplete answers. This high rate of response 80% is due to the questionnaire's convenient design, which required 10-15 minutes to complete.

QUESTIONNAIRE DESIGN

The questionnaire assessed the impact of security, privacy, reliability, and integrity on adopting blockchain technology in healthcare. The questionnaire consisted of two parts: the first part collects personal information about the respondent demographic data such as gender, age, educational level, job title, and work experience. The second part consisted of 31 questions to measure the impact of the four challenges across 4 axes each axis included a set of questions.

1. The first axis assessed the impact of security on the healthcare industry switching to blockchain-based cloud computing services.
2. The second axis assessed the impact of privacy on the healthcare industry when shifting to blockchain-based cloud computing services.
3. The third axis assessed the impact of reliability on the healthcare industry when shifting to blockchain-based cloud computing services.
4. The fourth axis assessed the impact of Integrity on the healthcare industry when shifting to blockchain-based cloud computing services.

Also, to remark on the arithmetic average of the variables, the study utilized the following equation to determine their respective importance [59]:

$$\begin{aligned}\text{Relative importance} &= \frac{\text{maximum value} - \text{minimum value}}{\text{number of levels}} \\ &= \frac{5 - 1}{3} \\ &= 1.333\end{aligned}$$

The score results of the applied equation indicate that <2.33 represents a poor level of importance, 2.33-3.67 represents an average level of importance, and >3.67 represents a high level of importance.

The following hypotheses were derived from the published studies:

1. The first hypothesis: Blockchain technology provides security features in healthcare.
2. The second hypothesis: Blockchain technology ensures patient privacy in healthcare.
3. The third hypothesis: Blockchain improves reliability in healthcare systems.
4. The fourth hypothesis: Blockchain maintains data integrity in healthcare records.

RESULTS

This section represents the results of the analyzed data from the questionnaire and the derived hypothesis from other studies.

DESCRIPTIVE ANALYSIS

The collected demographic data of the study participants were analyzed as shown in Table 2.

TABLE 2: RESPONDENTS' DEMOGRAPHIC DATA

Category	Sub-category	Repetition	Ratio
Gender	Male	62	62%
	Female	38	38%
	Total	100	100%
Age	Less than 30	49	49%
	30-39	25	25%

	40-49	20	20%
	50 or above	6	6%
	Total	100	100%
Education	Bachelor's degree	58	58%
	Higher Diploma	8	8%
	Master's degree	19	19%
	Ph.D.	15	15%
	Total	100	100%
Job	Nurse	14	14%
	Developer	20	20%
	Consultant	8	8%
	Doctor	43	43%
	Manager	15	15%
	Total	100	100%
Experience	5-10 years	56	56%
	11-15 years	15	15%
	16-20 years	14	14%
	21 or more years	15	15%
	Total	100	100%

Table 2 shows the participant's demographic data; the results indicate that 62% of males and 38% of females participated in the study. Most participants were younger than 49 years 49%, 25% aged 30-39 years old, 20% aged 40-49 years old, and 6% older than 50 years old. The educational level consisted of four groups, with 58% bachelor's degree, 19% master's degree, 15% Ph.D. degree, and 8% higher diploma degree. The job title for the participants shows that 43% were doctors, 20% were developers, 15% managers, 14% nurses, and 8% were consultants. Finally, job experience shows that 56% of the participants have 5-10 years of experience, 15% have 11-15 years of experience, 15% have more than 21 years of experience, and 14% have 16-20 years of experience, respectively.

RELIABILITY TEST

TABLE 3: RELIABILITY TEST RESULT

Case Processing Summary			
		N	%
Cases	Valid	100	100.0
	Excluded	0	0.0
	Total	100	100.0
a. Listwise deletion is based on all variables in the procedure.			
Reliability Statistics			
Cronbach's Alpha		No. of Items	
0.854		31	

Table 3 shows the results of the reliability test for the questionnaire items. Cronbach alpha test was applied to verify the stability and internal consistency of the questionnaire items. Cronbach's value of 0.7 and above for questionnaire items indicates reliable and consistent items. All used items in the questionnaire have a Cronbach alpha coefficient of 0.854, indicating that stable and consistent items were used in the study questionnaire [60].

NORMAL DISTRIBUTION TEST

TABLE 4: TEST OF NORMALITY

Type	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Security	0.134	100	0.185	0.957	100	0.073
Privacy	0.111	100	0.256	0.908	100	0.129
Reliability	0.147	100	0.361	0.935	100	0.226
Integrity	0.190	100	0.281	0.926	100	0.324
a Lilliefors Significance Correction						

The "Smirnova-Kolmogorov and Shapiro-Wilk" test was performed to determine whether the data were normally distributed. This test is essential when evaluating hypotheses since most parametric tests demand that the data distribution be normal. The test findings are shown in Table 4, where each axis' probability significance value is larger than 0.05.

MEANS AND STANDARD DEVIATIONS

To find out the estimates of the participants' work in the healthcare sector within the functional levels on the axes of the study, the arithmetic mean (M) and standard deviations (SD) of their answers were calculated, and the results of each axis are presented as follows:

TABLE 5: M AND SD VALUES FOR THE SECURITY AXIS

No.	Security	M	SD
1	Blockchain can provide increased control and access to patient information.	3.5500	0.72995
2	Blockchain increases the security of the medical supply chain.	3.5700	0.71428
3	Blockchain technology allows doctors to access backup records to verify a patient's identity without permission.	3.5900	0.77973
4	The main limitation of turning off patient-physician interoperability is data centralization.	3.4400	0.67150
5	Healthcare includes details about encryption algorithms such as AES-256, Health Insurance Portability and Accountability (HIPAA), and General Data Protection Regulation (GDPR).	3.6300	0.83672
6	Off-chain transactions are not recorded on the blockchain; hence it's necessary to ensure their safety and security.	3.7400	0.84829
7	Healthcare information powered by blockchain technology.	3.7000	0.82266
8	The systems in the chain must be secure to prevent unauthorized access, hacking, and other types of fraud.	3.7400	0.78650
9	An off-chain healthcare system stores stakeholder information.	3.8400	0.88443
10	You can retrieve information stored in the off-chain healthcare system.	3.8300	0.91071
11	I feel comfortable sharing my personal health information with other healthcare providers via blockchain technology.	3.6800	0.89758
12	I feel that the benefits of using blockchain technology in the healthcare system outweigh any potential security risks.	3.5500	0.71598
13	Blockchain technology provides instructions about the privacy procedures in place to protect your personal health information before you use it.	3.7500	0.82112
Security as a whole		3.6923	0.50871

- 1) *The Security Axis*: The first axis of the study sample focused on security, and the mean and standard deviations of the responses were calculated. The results are presented in Table 5.

Table 5 shows the M and SD of the participants for the items of the security axis. The M value for security items ranged between 3.44-3.84 indicating the level of importance for all the used items for this axis. For instance, item 9 has the highest M value of 3.84 indicating the high importance of storing patient information for future use. While item 4 has the lowest M value of 3.44 indicating a medium level of importance due to the consistency of the stored data about the patient. However, the overall M value for information security suggests the high level of importance for information security when using blockchain in healthcare.

- 2) *The Privacy Axis*: The second axis of the study sample focused on privacy, and the mean and standard deviations of the responses were calculated. The results are presented in Table 6.

TABLE 6: M AND SD VALUES FOR THE PRIVACY AXIS

Num	Privacy Statement	Mean (M)	Standard Deviation (SD)
1	Blockchain healthcare system protects the privacy and security of patient information.	3.4800	0.73140
2	Do you have any concerns about the privacy of your information when using the electronic healthcare system?	3.5100	0.77192
3	Do you trust the healthcare system?	3.4500	0.84537
4	Blockchain supports scrutiny and is reviewed by health organizations, regulators, payers, and individuals while protecting individual privacy.	3.6700	0.89955
5	Off-chain systems provide high privacy to protect sensitive information.	3.6000	0.86457
6	On-chain systems do not reveal sensitive information, such as transaction details and user identities, which can be a concern for privacy-sensitive applications.	3.8100	0.89550
7	Blockchain technology provides instructions about the privacy procedures in place to protect personal health information before using them.	3.7100	0.72884
8	I feel that the benefits of using blockchain technology in the healthcare system outweigh any potential privacy risks.	3.8800	0.72864
Privacy as a whole	Overall privacy perception in blockchain healthcare systems.	3.6887	0.53474

Table 6 presents the M and SD of the respondents for the items of the Privacy axis. The M value for privacy items ranged between 3.45-3.88 indicating the level of importance for all the used items for this axis. For instance, item 8 has the highest M value of 3.88 indicating the high importance of using blockchain in the healthcare system in dealing with potential risks of patient information privacy. Item 3 has the lowest M value of 3.45 among the axis items indicating a medium level of importance due to the important role of trust in the healthcare system for preserving patient information. However, the overall M value for information privacy indicates the importance of blockchain.

- 3) *The Reliability Axis*: The third axis of the study sample examined reliability, and the responses arithmetic means and standard deviations were extracted. These findings are presented in Table 7.

TABLE 7: M AND SD VALUES FOR THE RELIABILITY AXIS

No.	Reliability Statement	Mean (M)	Standard Deviation (SD)
1	There are challenges associated with using the healthcare system.	3.6800	0.73691
2	The patient privacy policies and procedures in the healthcare system linked to the blockchain are up-to-date to meet the specific requirements of the user.	3.6100	0.77714
3	In an emergency case, patients can authorize healthcare personnel to access their health information.	3.5900	0.81767
4	Blockchain technology does not provide training on how to secure personal health information.	3.5600	0.76963
5	I trust the healthcare system to protect my personal health information when using blockchain technology.	3.5400	0.74427
Reliability as a whole	Overall reliability perception in blockchain healthcare systems.	3.5960	0.53634

Table 7 presents the M and SD of the respondents for the items of the reliability axis. The M value for reliability items ranged between 3.54 and 3.68 indicating the level of importance for all the used items for this axis. For instance, item 1 has the highest M value of 3.68 indicating the high importance of dealing with the challenges that face blockchain in healthcare to improve system reliability. Item 5 has the lowest M value of 3.54 among the axis items indicating an average level of importance due to the recency of blockchain in the healthcare system for preserving patient information. However, the overall M value for reliability indicates an average level of importance for the healthcare system's reliability.

4) *The Integrity Axis:* The fourth axis of the study sample examined integrity, and the responses' arithmetic means and standard deviations were extracted. These findings are presented in Table 8.

TABLE 8: M AND SD VALUES FOR THE INTEGRITY AXIS

No.	Integrity Statement	Mean (M)	Standard Deviation (SD)
1	The Electronic Healthcare System retrieves the Electronic Healthcare Record (EHR).	3.5800	0.66939
2	I am aware of the laws and regulations governing the use of blockchain technology in the healthcare system and how they affect my personal health information.	3.4800	0.84662
3	Blockchain technology manages healthcare information systems.	3.4900	0.81004
4	Many stakeholders in the healthcare system would benefit from a better understanding of how people use and trust healthcare services.	3.4600	0.84591
5	I feel comfortable about my level of control over my personal health information when using blockchain technology.	3.6700	0.82945
Integrity as a whole	Overall integrity perception in blockchain healthcare systems.	3.5340	0.60306

Table 8 presents the M and SD of the respondents for the items of the integrity axis. The M value for integrity items ranged between 3.48 and 3.67 indicating the level of importance for all the used items for this axis. For instance, item 5 has the highest M value of 3.67 indicating the high importance of user control of personal information stored on the cloud. Item 2 has the lowest M value of 3.48 among the axis items indicating a medium level of importance in the regulations and laws that govern the use of blockchain in healthcare to deal with patient information. However, the overall M value for integrity

indicates a medium level of importance for the healthcare system's integrity. However, the overall M value for information privacy indicates the importance of blockchain.

- 1) *The Reliability Axis*: The third axis of the study sample examined reliability, and the responses arithmetic means and standard deviations were extracted. These findings are pre-presented in Table 7.
- 2) *The Integrity Axis*: The fourth axis of the study sample examined integrity, and the responses arithmetic means and standard deviations were extracted. These findings are pre-presented in Table 8.

Table 8 presents the M and SD of the respondents for the items of the integrity axis. The M value for integrity items ranged between 3.48 and 3.67 indicating the level of importance for all the used items for this axis. For instance, item 5 has the highest M value of 3.67 indicating the high importance of user control of personal information stored on the cloud. Item 2 has the lowest M value of 3.48 among the axis items indicating a medium level of importance in the regulations and laws that govern the use of blockchain in healthcare to deal with patient information. However, the overall M value for integrity indicates a medium level of importance for the healthcare system's integrity.

HYPOTHESES TEST

Study hypotheses were tested using one Sample T-test to compare the arithmetic averages of the study sample's responses to the weighted arithmetic mean value. The T value is calculated and the significance level is extracted. The value of the weighted average that was compared is 3. If the significance level is ≤ 5 , the results indicate a statistically significant difference in the answers of the study sample from the test average. Thus, the alternative hypothesis is accepted, but if the level of significance is >5 , it indicates that there are no statistically significant differences in the answers of the study sample from the average of the test. This means the null hypothesis is accepted, and the alternative hypothesis cannot be accepted. The results are as follows:

THE FIRST HYPOTHESIS (H01)

H01: Blockchain technology provides security features in healthcare.

TABLE 9: ONE-SAMPLE T-TEST RESULTS FOR H01

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
Security	100	3.6623	0.50871	0.05087		
One-Sample Test						
Test Value = 3						
	T	DF	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Security	13.019	99	0.000	0.6623	0.5614	0.7632

Table 9 indicates that the (T) value of (13.019) is statistically significant because Sig. <0.05 , while the M value of 3.66 reflects the significance of the positiveness of the first hypothesis. The M value is higher than the weighted test average of 3 and the significance level <0.05 . Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that security is available when using the blockchain from the viewpoint of workers in the healthcare sector in Jordan at a significant level ($\alpha \leq 0.05$).

THE SECOND HYPOTHESIS (H02)

H02: Blockchain technology ensures patient privacy in healthcare.

TABLE 10: ONE-SAMPLE T-TEST RESULTS FOR H02

One-Sample Statistics						
Variable	N	Mean	Std. Deviation	Std. Error Mean		
Privacy	100	3.6388	.53474	.05347		
One-Sample Test						
	Test Value = 3					
	T	DF	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	11.94	99	.000	.63875	.5326	.7449

Table 10 indicates that the (T) value of (11.94) is statistically significant because Sig. <0.05, while the M value of 3.63 reflects the significance of the positiveness of the second hypothesis. The M value is higher than the weighted test average of 3 and the significance level <0.05. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that privacy is important when using the blockchain from the viewpoint of workers in the healthcare sector in Jordan at a significant level ($\alpha \leq 0.05$).

THE THIRD HYPOTHESIS (H03)

H03: Blockchain improves reliability in healthcare systems.

TABLE 11: ONE-SAMPLE T-TEST RESULTS FOR H03

One-Sample Statistics							
Variable	N	Mean	Std. Deviation	Std. Error Mean			
Reliability	100	3.5960	0.53634	0.05363			
One-Sample Test							
	Test Value = 3						
	T	DF	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
	11.113	99	0.000	0.59600	0.4896	0.7024	

Table 11 indicates that the (T) value of (11.11) is statistically significant because Sig. <0.05, while the M value of 3.59 reflects the significance of the positiveness of the second hypothesis. The M value is higher than the weighted test average of 3 and the significance level <0.05. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that reliability is important when using the blockchain from the viewpoint of workers in the healthcare sector in Jordan at a significant level ($\alpha \leq 0.05$).

THE FOURTH HYPOTHESIS (H04)

H04: Blockchain maintains data integrity in healthcare records.

TABLE 12: ONE-SAMPLE T-TEST RESULTS FOR H04)

One-Sample Statistics					
Variable	N	Mean	Std. Deviation	Std. Error Mean	
Integrity	100	3.5340	.60306	.06031	
One-Sample Test					
	Test Value = 3				
	T	DF	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
	8.87	99	.000	.53400	0.4143 to 0.6537

Table 12 indicates that the (T) value of (8.85) is statistically significant because Sig. <0.05, while the M value of 3.53 reflects the significance of the positiveness of the second hypothesis. The M value is higher than the weighted test average of 3 and the significance level is <0.05. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that integrity is important when using the blockchain from the viewpoint of workers in the healthcare sector in Jordan at a significant level ($\alpha \leq 0.05$).

Table 13 presents the accepted hypotheses and confirms them with other studies.

TABLE 13: SUMMARY OF THE RESULTS OF THE STUDY HYPOTHESES

Study Hypothesis	Results	References
H01: Blockchain technology provides security features in healthcare	Accepted	Attaran, M. (2022); Abu-elezz et al., (2020)
H02: Blockchain technology ensures patient privacy in healthcare	Accepted	Hussein et al., (2021)
H03: Blockchain improves reliability in healthcare systems.	Accepted	Hussein et al., (2021)
H04: Blockchain maintains data integrity in healthcare records.	Accepted	Zarour et al., (2021)

Table 13 presents the outcomes of four hypotheses tested in a study focusing on blockchain technology in the healthcare sector in Jordan. Each hypothesis (H01 to H04) examines a specific feature of blockchain technology from the perspective of healthcare sector workers in Jordan. The hypotheses are formulated as null hypotheses, suggesting the inactivity or ineffectiveness of these features at a significant level ($\alpha \leq 0.05$).

The acceptance of all four hypotheses suggests that, from the perspective of healthcare sector workers in Jordan have important implications for the adoption and implementation of blockchain technology in Jordan's healthcare sector. It suggests a potential gap between the theoretical benefits of blockchain and its perceived effectiveness in practical application within this specific context. The references provided offer avenues for further investigation into the reasons behind these perceptions and potential comparisons with findings from other contexts or regions.

DISCUSSION

The results of H01 showed the use of the blockchain that provides information security. Published studies attribute such results to the fact that one of the main features of blockchain technology is its ability to provide secure and clear data storage. This is achieved using cryptographic algorithms and consensus mechanisms, which ensure that transactions recorded on the blockchain are immutable and can only be modified by the consensus of network participants.

Furthermore, because blockchain offers a high level of security, it is a good fit for applications like medical records that need to transmit and store sensitive data securely. Blockchain technology can improve security, but it's vital to remember that it's not a magic bullet and needs to be used correctly to be effective. Furthermore, if blockchain technology is not developed and maintained appropriately, it may be subject to assaults and is not impervious to all security risks. These findings are consistent with Swan's (2015) design for developing a new economy using blockchain technology.

The results of H02 demonstrated that blockchain offers information privacy. However, blockchain-based solutions growth and acceptance in numerous industries indicate that blockchain technology is a potential means of protecting personal information privacy. These results are consistent with the results of [61] who argues that blockchain enables information sharing while preserving the privacy of parties involved in the supply chain. Further, the author suggested that blockchain technology can help meet key supply chain management objectives, such as reducing fraud, enhancing trust, and improving efficiency. Also, [62] argue that blockchain technology can be used to protect personal health information. The authors noted that blockchain-based solutions can ensure data integrity, confidentiality, and availability are essential for maintaining personal privacy in healthcare. The results of H03 demonstrated how using the blockchain increases

reliability, which is crucial for consumer trust in such technologies. These findings are consistent with [63] study, which discovered that blockchain technology improves the supply chain management systems' dependability and transparency. According to the report, blockchain technology can offer a safe and impenetrable platform for tracking products and confirming their legitimacy, enhancing the supply chain system's dependability.

The results of H04 show how information integrity is protected by blockchain technology. These findings are consistent with those of [64], who examined the application of blockchain technology to the defence of intellectual property. The study concluded that the high degree of support for blockchain technology's integrity feature suggests that it has the potential to be a dependable and secure method for safeguarding intellectual property. The report emphasizes how blockchain technology can completely transform the healthcare sector in Jordan. Blockchain can offer a strong foundation for handling patient data by solving security, privacy, dependability, and integrity issues. This shift is essential for raising patient and provider trust, optimizing data management, and improving patient care.

This comprehensive analysis provides significant insights and a compelling case for blockchain technology implementation in the Jordanian healthcare system, highlighting the transformative benefits and addressing critical challenges.

CONCLUSION

Achieving patient data confidentiality and privacy requires the use of blockchain technology. The blockchain's ledger feature makes it possible for data secure exchange and keeps patient data protected against unauthorized access. Furthermore, when granting authorized people access to certain data smart contracts enhance patient privacy. Such technology's stability guarantees that every transaction is traced and documented, creating an open audit trail. However, several obstacles prevent such technologies in the healthcare industry, such as high cost, complexity, interoperability problems, and regulatory requirements. To protect patient privacy and information security, it's recommended to evaluate the utilized systems that provide healthcare facilities. To ensure that information is accessible by authorized individuals for designated purposes, stringent policies that control accessibility and usage purposes are also used. The restricted dispersed sample of the questionnaire might impact the validity and reliability of the study's findings. Furthermore, this constraint might impact how broadly the study's findings may be applied. Thus, to guarantee the validity and trustworthiness of the data, it is advised to raise the sample size. further to ensure that the healthcare system conforms with relevant rules and regulations. Therefore, ensuring the healthcare system has the proper tools and training to teach staff members how to access and utilize data stored on the blockchain is recommended. Furthermore, the blockchain should be checked and inspected to ensure its functioning correctly, that the data is safe, and that only authorized users may access it. Future blockchain research should concentrate on creating interoperable, scalable blockchain technologies that satisfy privacy concerns and legal constraints. To guarantee that blockchain technology can be efficiently applied in healthcare systems new consensus methods and privacy-preserving technologies need to be created. Thus, policy makers in Jordan must establish a regulatory framework for blockchain adoption in healthcare, ensuring its compliance with the existing healthcare and data privacy laws. Finally, infrastructure enhancements must be developed to be compatible with blockchain systems.

Future work should focus on developing scalable blockchain solutions that ensure interoperability and seamless integration with existing healthcare systems. Also, cost, infrastructure, and legal challenges for blockchain adoption must be investigated further in future research.

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THE ROLE OF PATIENT PROVIDER SUPPORT AGENCIES (PPSA) IN SUPPORTING PRIVATE SECTOR PROVIDERS AND THEIR PATIENTS IN TUBERCULOSIS CARE: PERSPECTIVES AND EXPERIENCES OF PRIVATE SECTOR PROVIDERS IN AN EASTERN INDIAN STATE

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ABSTRACT

INTRODUCTION:

More than half of tuberculosis (TB) patients in India seek medical care at private facilities. Several models have been tested for effective private-sector engagement in TB care. Patient-Provider Support Agencies (PPSA) offer end-to-end TB care to private-sector TB patients.

OBJECTIVES:

This study aimed to understand the perspectives and experiences of private sector providers regarding the role of PPSA in delivering services to their TB patients in Odisha, India.

METHODS:

A qualitative descriptive method was employed to study purposively selected private sector providers across seven PPSA districts in Odisha.

RESULTS:

Among the 20 private sector providers, 15% notify more than 15 cases each year, while 20% notify fewer than five cases annually. All providers were aware that TB is a notifiable disease, and 95% of providers knew someone from the PPSA agency in their district. The providers strongly believe that PPSA is an effective model for delivering services to their patients.

CONCLUSIONS:

PPSA agencies provide essential support for private-sector patients in executing public health actions and enhancing private-sector notification.

KEYWORDS

private sector engagement, public private mix, partnership, TB patients, private practitioners

INTRODUCTION

As set out in the Global TB Burden Report [1], India contributes to more than a quarter (26%) of the world's tuberculosis (TB) burden. India is the country with the highest burden of drug-resistant TB worldwide, accounting for 27% of all cases [1]. The National Strategic Plan 2012–2017 advocates that all TB patients in the community must have "universal access to quality diagnosis and treatment" services [2]. To guarantee that all TB patients in the community have "universal access" to high-quality diagnosis and treatment, the National Tuberculosis Elimination Program (NTEP) has established a new goal. Expanding efforts to engage all care providers and stakeholders is one of the essential pillars towards achieving universal access [3]. More than half of the TB patients in India seek care from the private sector [4]. About 32% of all TB notifications in the country come from the private sector [5]. Moreover, the private sector's involvement is scattered across the country despite multiple efforts of the program.

There are gaps in the TB care cascade when it comes to individuals with active TB not being able to get a proper diagnosis or support for completing their treatment. This scenario is more evident among the patients diagnosed in the private sector compared to the public sector. A comparative analysis revealed distinct clinical and sociodemographic features between TB patients treated in public and private healthcare facilities. The rampant usage of chest X-rays for diagnosis and the administration of unmonitored and unregulated treatment regimens were more common among private sector practitioners. Interestingly, more than 60% of all TB medication sales were provided by private sector providers. Public sector providers, on the other hand, followed controlled treatment regimens and showed a preference toward sputum microscopy as the mode of diagnosis [6–12]. The private sector TB care cascade has several challenges, including diagnostic disparities, inefficient patient management, knowledge gaps, and a lack of standardised diagnostic and treatment regimens. These flaws cumulatively contribute to the poor quality of TB care in the private sector [7, 8, 10–17].

Because the issues related to the public and private sectors differ, separate interventions for private practitioners and their TB patients are required. Furthermore, most of the cases treated in the private sector do not get notified adequately [18]. These are the factors that make the private sector involvement a top strategic priority in India's plan to eliminate tuberculosis. The "Patient Provider Support Agency" (PPSA) uses a combination of patient subsidies and provider incentives to improve standards of diagnosis and treatment amongst private providers, demonstrating an example of an efficient private sector engagement model in India [19]. A private provider is any entity (such as a private laboratory, clinic or hospital) or individual (a physician) that is engaged in TB care through the entire cascade of TB care. Initially implemented by PATH and World Health Partners in two Indian cities Mumbai and Patna respectively, resulted in a rapid increase of TB notifications from the private sector [20]. The partnership option of PPSA, under domestic funding of the National TB Elimination Programme (NTEP), was initiated in the Eastern Indian state of Odisha to close the gaps and enhance private sector engagement, in the 2nd quarter of 2021. Patients seeking care in the private sector can receive end-to-end TB care under this partnership option. The PPSAs are operational across seven districts in the state with a high private sector TB burden contributing to 65% to 70% of the TB notifications annually. By March 2024, the PPSAs have completed three years of their operation. Given this background, the current study tried to understand the perspectives and experiences of private sector providers on the role of PPSA in rendering services to their TB patients.

OBJECTIVE:

The main objectives of this study were to understand the perspectives and experiences of the private sector providers on the role of PPSA in rendering services to their TB patients across seven PPSA-implemented districts of Odisha.

MATERIALS AND METHOD:

METHODOLOGY:

A qualitative descriptive method was adopted for this study [21].

STUDY SETTING:

The study was conducted across six revenue districts that include seven NTEP districts of Odisha. Bhubaneswar Municipal Corporation which is a NTEP district is a part of Khordha revenue districts. These seven districts were chosen purposively as PPSAs were operational across these districts of Odisha since the 2nd quarter of 2021.

STUDY SAMPLE:

A total of twenty private sector providers, whose patients were currently supported by the PPSA across these seven districts, were selected. The providers who gave consent, volunteered to participate in the in-person interview, and expressed their interest in sharing their experiences about the PPSA operationalisation and the support provided to them and their patients were included in the study. Approximately three participants per district were chosen for the study.

STUDY TOOL:

The study tool named "Provider tool" was used for this study. The tool had two sections: Socio-demographic profile and PPSA support. The tool was a blend of structured questionnaires with multiple options and open-ended questions to understand the behavioural facets of the study participants. The tool was developed by a team of experts that included public sector TB program managers, development sector professionals experienced in program evaluation, and monitoring and evaluation experts. Post-development, the tool was pilot tested in the Bhubaneswar Municipal Corporation area. With two minor modifications, the tool was finalised to be used for data collection. Excluding the socio-demographic characteristics, the tool consisted of a total of 13 questions, of which five were closed-ended questions with multiple options to answer, and the rest were open-ended questions. The validation of the tool involved face validation and pilot testing.

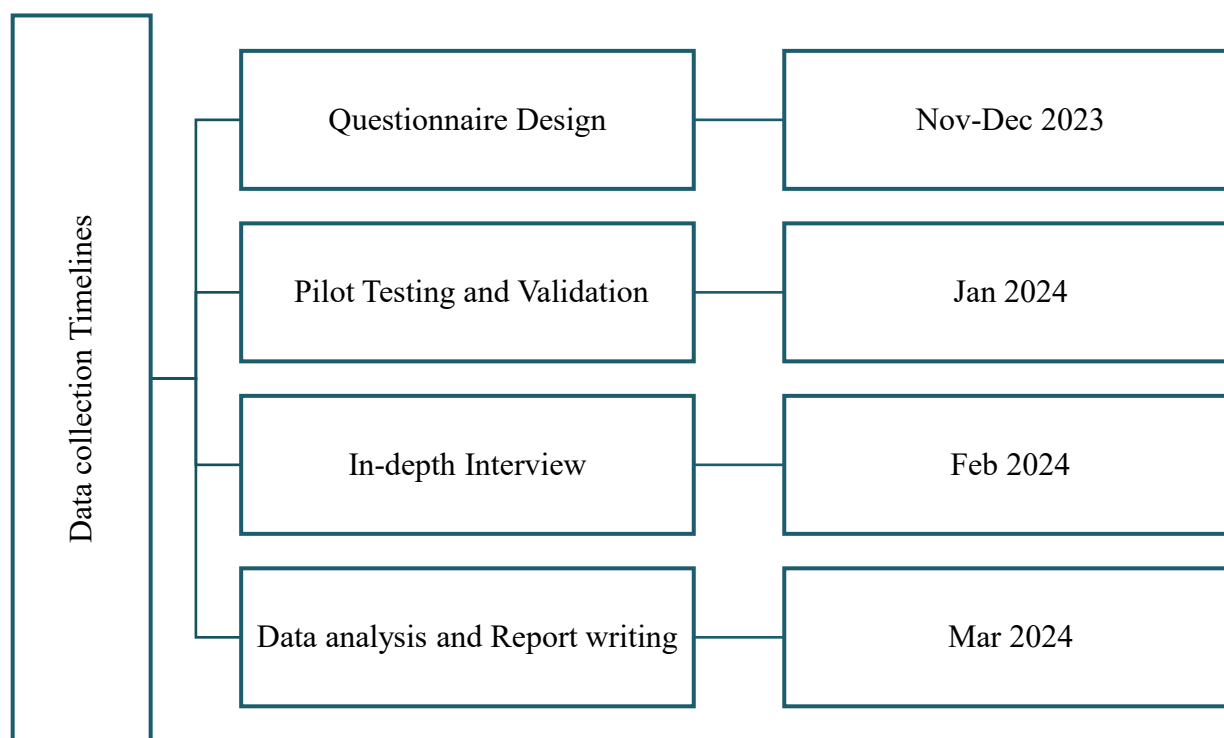
DATA COLLECTION METHOD:

The data were collected in two different ways, simultaneously. The responses with multiple options were collected in the questionnaire itself and the responses for the open-ended questions were recorded using a mobile recording device. The recorded contents were transcribed verbatim, and the key findings were extracted by reading the transcribed data repeatedly.

TIMELINE OF DATA COLLECTION:

The data were collected over two weeks in January and February 2024. The following Figure 1 depicts the data collection timeline for this study.

FIGURE 1: DATA COLLECTION TIMELINE



ANALYSIS:

The data collected through the close-ended questions were analysed using MS Excel and presented in proportions and the responses to open-ended questions underwent thematic analysis and were presented under various themes as emerged during the analysis [22].

ETHICAL CONSIDERATION:

The study did not require ethical approval, as per the National Ethical Guidelines for Biomedical and Health Research involving Human Participants, 2017 (Section 4.8.1, page 36) of the Indian Council of Medical Research, Government of India. Following the Declaration of Helsinki, the researchers maintained the confidentiality and integrity of the study participants while closely adhering to survey ethics. Every participant gave their informed consent before participating voluntarily in the study, and interviews were recorded using a mobile device with the respondents' permission. Complete data confidentiality was guaranteed during the handling, storing, and analysis of data.

RESULTS:

The study assessed the perceptions and experiences of 20 private providers across seven PPSA-implemented districts of Odisha. Table 1 delineates the profile of the study participants. The study found that 15% of the providers notify more than 15 cases in a year and 20% notify less than five cases in a year. All the private providers were aware that TB is a notifiable disease and 95% of them knew some representatives from the PPSA agencies operational in their respective districts. Figure 2 depicts the map of Odisha with operational PPSA districts, Figure 3 depicts the awareness of the private practitioners of any of the team members of the PPSA who are in touch with the provider to render the services to his/her patients. Similarly, Figure 4 depicts the percentage of the private practitioners who believe that PPSA is an effective model of private sector engagement for the support to their patients and Figure 5 depicts the type of services provided by the PPSA to the private providers.

FIGURE 2: MAP OF ODISHA DEPICTING 7 PPSA IMPLEMENTATION DISTRICTS IN THE STATE.

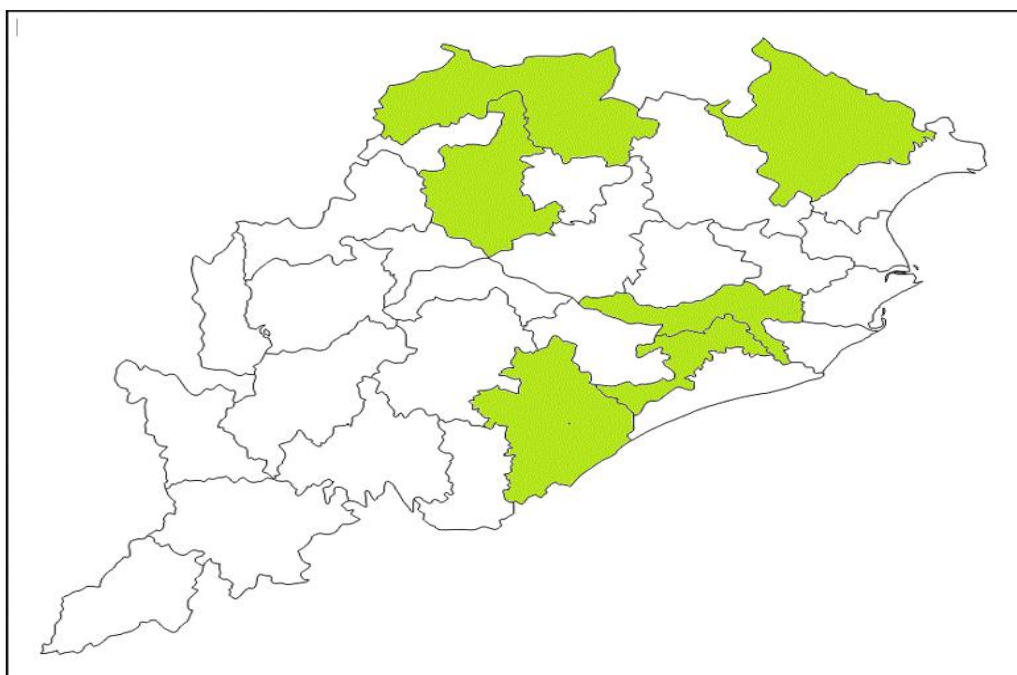


TABLE 1: CHARACTERISTICS OF PRIVATE SECTOR PROVIDERS (N=20)

Profile of Providers	Categories	n	%
Years of Experience	More than 30 Years	4	20.0%
	(15-30) Years	6	30.0%
	(7-15) Years	5	25.0%
	Below 7 Years	5	25.0%
Number of TB Notification per month	More than 15 Notifications	3	15.0%
	(11-15) Notifications	8	40.0%
	(6-10) Notifications	5	25.0%
	Less than 5 Notifications	4	20.0%

FIGURE 3: PERCENTAGE OF PRIVATE PROVIDERS WHOARE AWARE OF SOMEONE FROM THE PPSA TEAM (N=20)

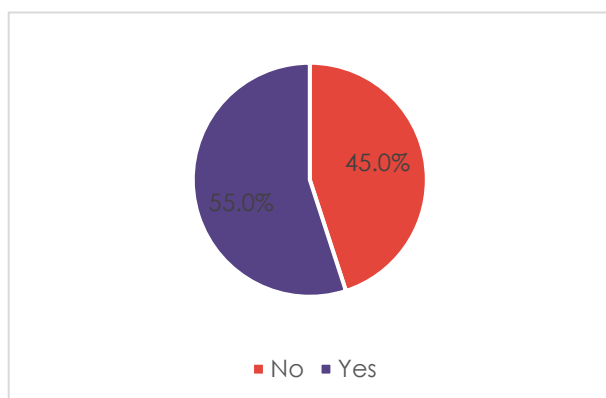


FIGURE 4: PERCENTAGE OF PRIVATE PROVIDERS WHO BELIEVE THAT PPSA IS AN EFFECTIVE MODEL FOR THE SUPPORT OF THEIR PATIENTS (N=20)

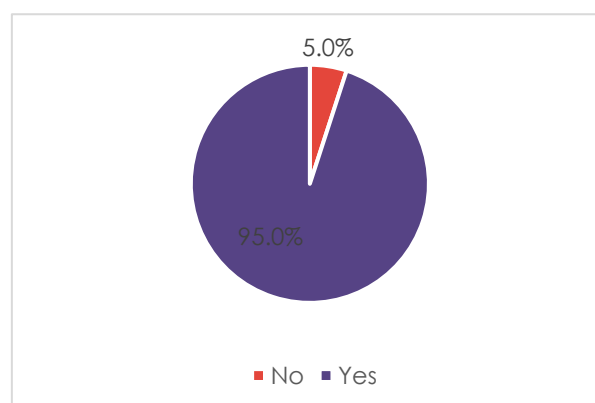
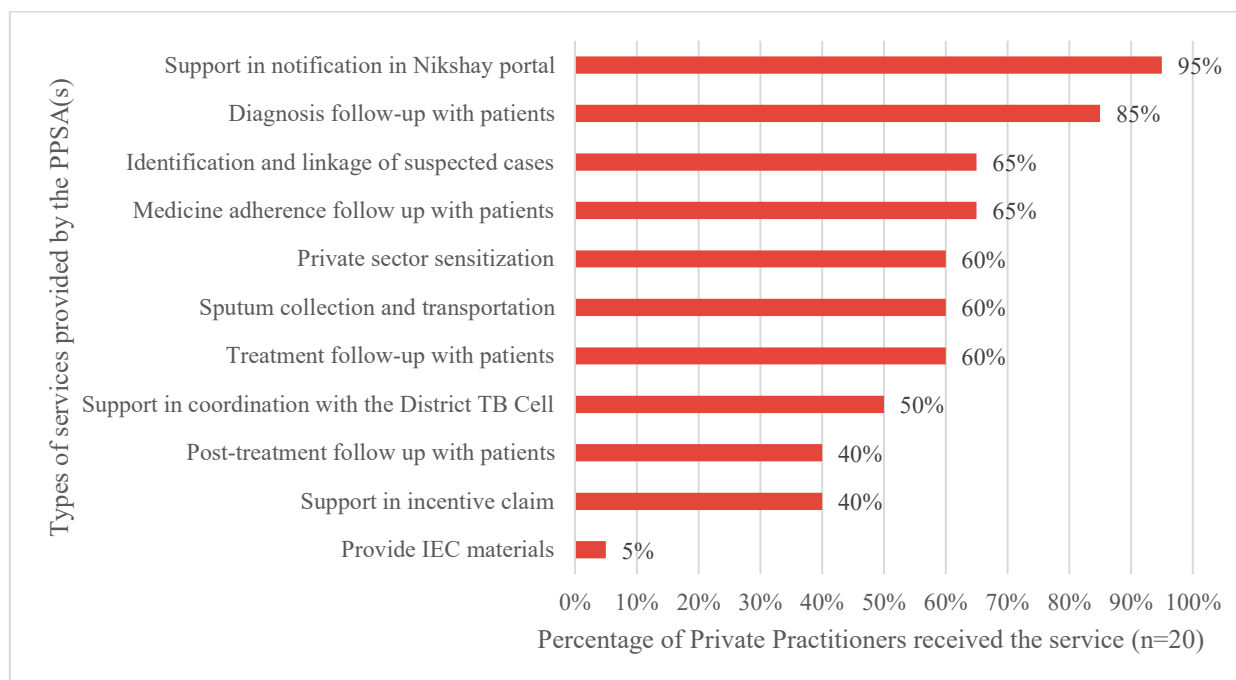


FIGURE 5: TYPE OF SERVICES PROVIDED BY PPSA(S) TO THE PRIVATE PROVIDERS AND THEIR PATIENTS.



In-depth interviews were conducted among 20 private practitioners to understand their perception and experience about the support of PPSA agencies to them and their patients across all the seven PPSA-implemented districts of Odisha.

SUPPORT OF PPSA IN ENSURING PUBLIC HEALTH ACTION:

The study found that PPSA has been a great support in ensuring public health action for private-sector patients. 65% (n=20) of the providers admitted that PPSA helps in identifying the suspected cases and linking them for diagnosis and treatment, 60% of them reported that PPSA supports sputum collection and 85% and 60% of them admitted that PPSA supports follow up with their patients for diagnosis and treatment, respectively. Similarly, 65% reported that PPSA supports medicine adherence and 40% reported that PPSA also carries out post-treatment follow-up. Many of the providers stated the support of PPSA(s) in rendering public health action to their patients.

"Without the PPSA, it is not possible to reach out to each patient. They help in the public health action of my patients. In addition, they help in Adverse Drug Reaction management. However, they should adopt the patient-friendly approach and maintain the privacy of the patients."

- Private provider in Sundargarh district

"Yes definitely, I can tell you that previously patients used to take medicines privately from drug stores and used to discontinue after one or two months however with their support these patients are linked to the public health system, and they are now completing the course."

- Private provider in Ganjam district

"After the diagnosis, I contacted the PPSA person (Parameshwar) for the public health action."

- Private provider in Ganjam district

"It is a good initiative. We are getting immense support from the PPSA staff. The approach is very systematic. They collect samples from the patient's home. Earlier it was not possible. The model is convenient for me as well as for the patients. Patients are getting benefitted for sure."

- Private provider in Cuttack district

"PPSA is working very well. The PPSA initiative is wonderful. It saves us time. The patient's time is also saved. Now, Doctors only have to diagnose and treat the patients. They also follow up with the patients on medicine adherence. I am more than satisfied. Patients' stigma is also reduced with their help."

- Private provider in Cuttack district

"It is undoubtedly a good initiative. It saves me time on administrative work. Also, as PPSA is following up with patients, it is quite beneficial to them too."

- Private provider in Bhubaneswar MC

"Vital support in linking of patients for subsequent treatment."

- Private provider in Ganjam district

SUPPORT IN PRIVATE SECTOR NOTIFICATION:

60% (n=20) of the private providers admitted that they received sensitization from the PPSA agencies regarding the significance of private sector notification and Standards of TB care in India. Almost all the private providers (95%) admitted that they have received support for notification in the Nikshay portal. One of the providers stated that-

"The district NTEP and the PPSA field officer Mr. Sahadev helped me in getting registered in Nikshay. Sahadev visits me once a month to help me notify all my cases in Nikshay however the earlier district manager used to visit once in six months."

- Private provider in Sambalpur district

"Given my busy schedule and patient footfall in my clinic, I do not get time to notify TB cases, although I am aware that TB is a notifiable disease. This boy, Alok (referring to the PPSA representative) approached me one day and he is now completely facilitating the entry of my patient's details into the Government portal. It is a timely help to me."

- Private provider in Cuttack district

BRIDGE SUPPORT BETWEEN PATIENT AND PUBLIC SYSTEM:

Half of the providers admitted that PPSA also helps in linking with the District TB cell and at Block level functionaries as and when needed in ensuring pertinent services for the patients and the practitioners as well. Two of the providers stated that-

"Especially in coordinating with the District TB Unit and other TB staff members. It's a good initiative by the Government of India for connecting both patients and practitioners and the Government system as and when needed."

- Private provider in Khordha district

"I found that many patients who came to my clinic were not aware of the national program that they could get free diagnostic and treatment services. Even I was not aware that there are financial benefits for us and patients as well. These PPSA representatives made me aware of this and now my patients are linked with the public system and are getting free diagnosis and treatment, I feel this is a good initiative for poor patients."

- Private provider in Sambalpur district

SUPPORT FOR INCENTIVES TO PROVIDERS:

It was found that 40% (n=20) of the private providers have received support for claiming incentives for the notifications. One of the private providers admitted that the PPSA provides support in notification and claiming the incentives linked with it and helps in connecting the patients with the providers and government system. He stated that-

"The field workers are working very well; especially in co-ordinating with the patients and DTC. It's a good initiative by the Government of India to connect both patients and practitioners. It saves me time while generating notifications and incentive claims. Additionally, they do patient-level follow-up for diagnosis and treatment."

- Private provider in Khordha district

"Alok (referring to the PPSA representative) is a big help to my practice. Although I receive the incentives, it's not timely many times however this guy has followed up with the Government office to make sure that I get that in time. In addition, he also helped me with notifications and connected my patients with the district hospital where they could easily get the tests done."

- Private provider in Cuttack district

A GOOD MODEL OF PRIVATE SECTOR ENGAGEMENT FOR TB ELIMINATION:

Given the support of PPSA in ensuring the variety of public health actions to the private sector patients and the providers as well, some of the providers realized that PPSA is a good model of private sector engagement for TB elimination efforts in the state. One of the providers stated that-

"Yes, PPSA contribution is vital for TB elimination effort. They are working very well."

- Private provider in Bhubaneswar MC

"You know! This is a very comprehensive model, and I liked it very much. Given the complexity of TB treatment, it provides very good support starting from creating awareness to linking patients for diagnosis and treatment and assisting them in getting the financial benefits under the national program."

- Private provider in Cuttack

DISCUSSION:

The National Strategic Plan (NSP) for TB Elimination 2017-2025 emphasises the government's role as an enabler rather than the sole provider of TB care. The NSP intends to ensure that services for privately managed patients are established following India's TB Care Standards [23]. The PPSA model, which is in line with the NSP, has helped to enhance the quality of treatment for patients accessing the private sector, lower out-of-pocket costs for testing and drugs, and strengthen the health system to enable universal access to TB care. The agencies provided the patients with verifiable access to the entire cascade of TB services. The model demonstrated that low-cost, locally customised private sector participation methods with strong administrative support are both viable and beneficial to society. Moreover, the Joint Effort for TB Elimination initiative, a private provider support agency, helped to build sustainable processes for private sector engagement by customising a collaboration and monitoring framework. It is based on the private sector's social obligation paired with profitable customer care services, as well as the government's actual involvement in enabling TB services to the entire population, including those seeking care in the private sector. It is a win-win-win situation for the patient, NTEP, private hospitals, and society, making it easily scalable and replicable [24].

The Providers admitted that the PPSA helped them in notification of cases diagnosed at their end which is also evident from the analysis of Nikshay's data post-implementation of PPSA in the state. In the third year (2023) of PPSA implementation, the state achieved 100.5% of TB notifications against the target which is 1.3% higher than the previous year (2022) however if compared with the base year (2021) the improvement is 29.3%. Until the implementation of PPSA, the notification achievement in the year 2020 was 50.7% which was substantially low which indicates that PPSA implementation is a successful model in achieving the private sector notification. A similar assessment of the role of PPSA in Jharkhand shows an increase of notification of 22.9% in 2019 to 33.5% in 2020 [25].

It is important to note that private providers are happy with the public health support provided to their patients. The support included diagnosis, treatment, follow-up, and treatment adherence. Needless to mention these support services to the patients lead to better treatment outcomes among the private sector patients [9]. The Nikshay analysis reveals that post implementation of the PPSA model, the successful treatment outcome during the three years from 2021 to 2023 has consistently been more than 90% in the state. It is also important to note that PPSA acts as a bridge between the private sector and the public sector for the betterment of the patients and the community at large. It is well understood that for the public sector and the private sector work with different objectives, modus operandi, and target audiences with very

few or no occasions of convergence unless catalysed by a third party PPSA plays that catalyst role which is important for the program [24]. This study also found that private providers realise that PPSA thrives to narrow down the gap between the patients and the public system.

The NTEP has used a range of strategies to engage the private sector, including education, regulation, provision of free TB services, incentives, and partnership options. As a result of all these efforts, the private sector has significantly contributed to TB notification, follow-up, and treatment success. However, they fall short of meeting the objectives. Strategies emphasised purchasing services rather than fostering long-term partnerships. There are no substantial strategies to engage the varied range of providers, including informal health care providers and chemists, who are the first point of contact for a large proportion of people with TB. The state should come up with an integrated private sector engagement policy that focuses on ensuring quality TB care for all citizens. The NTEP should implement a strategy specifically adapted to the various categories of providers given the medical pluralism in the country. To ensure meaningful inclusion in the private sector, it is also necessary to improve understanding and generate data intelligence for improved decision-making, strengthen engagement platforms, and increase social insurance coverage [12].

STRENGTHS AND LIMITATIONS OF THE STUDY:

The study has three important strengths. First, it focused on private providers that are relatively under-researched in the context of TB care, capturing their perspectives. Secondly, it encompassed a diverse geography, covering seven districts in the state where PPSA is implemented, which show variations in health systems and socio-cultural aspects. Thirdly, the study found a high level of awareness about PPSA services among private practitioners, suggesting potential for expansion in other areas of the state.

There are two limitations: one is the small sample size, and the other is that it only considered private sector providers in the PPSA operational districts across the state. Including perspectives from private sector patients, PPSA representatives, and government service providers would have provided a more comprehensive understanding of the larger context, resulting in better insights for findings that could be generalised and transferred to similar settings environments.

IMPLICATIONS OF THE STUDY:

Scaling up the operationalization of PPSA: The positive feedback from private providers suggests that the implementation of PPSA can be expanded to other districts in the state.

Tailored provider engagement: The study also found that some providers notify less than their counterparts, indicating that customized strategies must be adopted by the PPSA agencies to engage them effectively.

Policy implication: Given the success of PPSA's implementation, it can also be integrated as a mainstream private sector engagement strategy in other regions.

CONCLUSION:

The unique characteristics of the supply and demand sides in the health system highlight the multifaceted nature of the TB care cascade. A well-established approach in the form of the public-private partnership (PPP) model [6, 7, 24] significantly contributes to TB control by improving patients' access to TB services. The contribution of various models is well-documented, and PPSA is being implemented in several parts of the country. In addition, if the state plans to provide universal access to TB care for private sector patients, it is essential to identify the bottlenecks and enablers specific to the private sector in the TB care cascade and to introduce more novel private sector options models.

ACKNOWLEDGEMENT:

The authors sincerely acknowledge the support received from the State TB Cell, Odisha, and the District TB cells in the respective districts. They express gratitude to the Additional Director of Health Services-TB, Joint Director of Health Services-TB, and other staff members of the State TB Cell, Odisha, as well as the District TB Officers and District Project Coordinators from each of the districts, along with the other staff members of the district TB cells across all seven study districts. The authors also thank all the study participants for their consented participation in the study.

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FACTORS DRIVING THE ADOPTION OF ONLINE MEDICAL PLATFORMS BY INFECTIOUS DISEASE PATIENTS: PSYCHOLOGICAL DISTANCE AS THE MEDIATOR

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ABSTRACT

INTRODUCTION

Managing common infectious diseases is becoming more challenging for public health. Patients often face high infection risks, limited medical resources, complex treatment procedures, psychological stress, and unequal access to information. This study is based on the Technology Acceptance Model and Construal Level Theory. It uses Covariance-Based Structural Equation Modeling (CB-SEM) to examine how psychological distance, perceived usefulness, and perceived ease of use influence patients' intention to use online medical platforms.

METHODS

To enhance the healthcare experience for patients with infectious diseases, this study examines psychological distance as a mediating factor in the adoption of telemedicine. We conducted a structured survey with 563 patients in Guangdong Province, China, from June 2023 to July 2024. We analyzed the relationships among perceived usefulness, perceived ease of use, psychological distance, and behavioral intention using AMOS and SPSS 22.0.

RESULTS

The results show that perceived usefulness greatly increases perceived ease of use. Psychological distance was found to mediate the effects of both perceived usefulness and perceived ease of use on patients' intention to adopt telemedicine services ($p < 0.05$). The CB-SEM analysis confirms the theoretical consistency and demonstrates the model's flexibility. These findings suggest that psychological distance is a crucial mechanism through which perceived usefulness and ease of use influence the adoption of telemedicine among patients with infectious diseases.

CONCLUSIONS

Three factors—perceived usefulness, perceived ease of use, and psychological distance—affect the adoption of telemedicine. Among these, psychological distance acts as a key mediator. When telemedicine platforms reduce psychological distance in four areas (temporal, spatial, social, and situational), they significantly increase the willingness of infectious disease patients to use remote healthcare services.

KEYWORDS

technology acceptance model; construal level theory; telemedicine; online medical platforms; CB-SEM.

INTRODUCTION

Today, digital adoption is a widespread phenomenon driving change in sectors like healthcare, education, business, and government[1, 2]. The success of online learning, remote work tools, and telemedicine largely depends on users' willingness to adopt and regularly use these new technologies[3, 4]. Adoption is influenced not only by technical factors, such as ease of use and usefulness, but also by psychological perceptions, including trust, risk, and psychological distance[5, 6]. Therefore, understanding digital adoption mechanisms requires both an information systems approach and insights from psychology and sociology.

The importance of digital healthcare is even more crucial in caring for patients with infectious diseases[7]. Because they have high incidence and transmissibility, contagious diseases continue to burden public health systems worldwide, threatening not only individual health but also social stability[8]. For example, in 2023, Guangdong Province in China reported over 18.7 million cases of notifiable infectious diseases and 26,900 deaths, illustrating the heavy burden on the healthcare system. Given the limited resources of traditional healthcare, digital healthcare is seen as a key alternative, helping to alleviate resource constraints, reduce the risk of cross-infection, and directly impact patient health and the effectiveness of public health prevention and control measures[9].

To better understand patient adoption of digital health, the Technology Acceptance Model (TAM) has been widely utilized by researchers[10]. Building on TAM, the Unified Theory of Acceptance and Use (UTAUT2)[11, 12] model considers multiple factors, such as trust, privacy concerns, digital health literacy, and hedonism, enhancing its ability to explain consumer-centric healthcare scenarios[13, 14]. However, these models primarily focus on technology and rational evaluation, failing to fully grasp the psychological decision-making processes of patients in high-risk and uncertain situations.

To address this limitation, Construal Level Theory (CLT)[15] offers a new perspective within cognitive psychology for studying digital health adoption. CLT proposes that closer psychological proximity leads to more concrete processing of information and actions[16]. Previous research has demonstrated a strong connection between psychological proximity, risk perception, and behavioral intention [17, 18]. For example, when social psychological proximity is high, individuals tend to perceive risks more acutely and are more likely to take protective or medical measures[19]. Additionally, a systematic review highlights that factors such as trust, technology quality, and privacy concerns are strongly linked to the intention to adopt digital health solutions[20]. However, no research has yet specifically explored how technological features influence patients' adoption of telemedicine through psychological proximity.

So far, existing research has not adequately integrated technological factors with psychological mechanisms. In particular, the fundamental ways in which technological features influence patients' adoption of digital health through psychological distance remain unclear. In other words, patients' decisions are often affected by both technological attributes (such as ease of use and usefulness) and psychological perceptions (such as risk and trust). However, the interaction between these two factors has not been systematically empirically validated. Therefore, this study aims to incorporate CLT into the TAM framework, using psychological distance as a mediating variable to explore its role in telemedicine adoption and to emphasize both the universality and specificity of health technology adoption within the broader context of digital adoption theory.

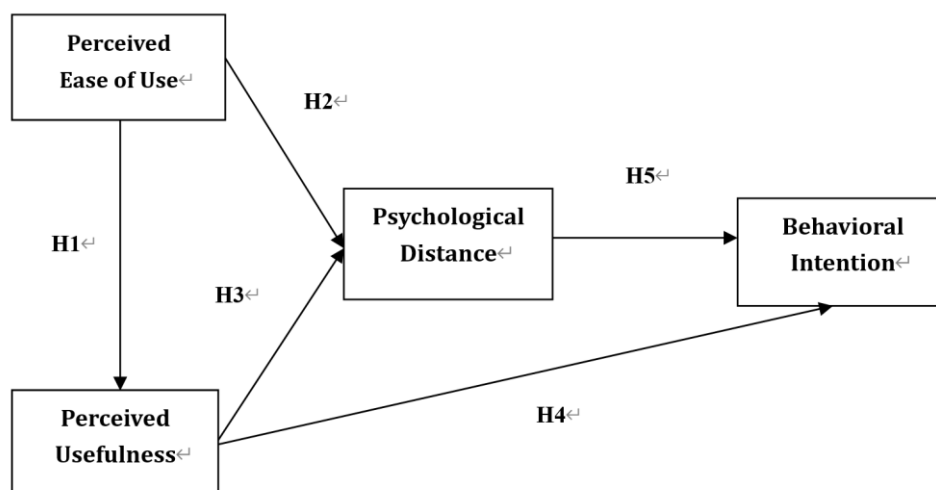
MATERIALS AND METHODS

This study surveyed patients with infectious diseases in Guangdong Province, China, and obtained 563 valid responses between June 2023 and May 2024. The sample size met the requirements for CB-SEM. Data were collected via an online questionnaire distributed through the Wenjuanxing platform [21] and accessed by QR code. Screening questions confirmed participants had both experienced an infectious disease and used an online medical platform. A 5-point Likert scale was employed to reduce bias, and anonymity was strictly maintained. On average, the survey took 10 minutes to

complete. Missing data were treated with multiple imputations in SPSS 22.0, followed by data cleaning and consistency checks.

The study employed TAM as its primary framework and incorporated CLT to extend the model. Most constructs were measured reflectively, allowing CB-SEM to assess overall model fit. The research examined how perceived ease of use (PEOU), perceived usefulness (PU), and psychological distance (PD) affect patients' intention to adopt telemedicine (BI). PD was modeled as both a direct determinant of BI and an indirect factor shaping PEOU and PU. This design enabled exploration of PD's role in technology adoption under conditions of high infection risk or psychological stress, offering a methodological basis for optimizing online medical platforms. The proposed model is presented in Figure 1.

FIGURE 1. RESEARCH MODEL.



Therefore, we make the following assumptions:

H1: PEOU has a positive and significant effect on PU.

H2: PEOU has a significant negative impact on PD.

H3: It is hypothesized that PU has a significant adverse effect on PD.

H4: A strong positive relationship exists between PU and BI among patients.

H5: The BI is significantly negatively affected by PD.

H6: The connection between PEOU and BI is mediated by PD.

H7: The connection between PU and BI is mediated by PD.

PARTICIPANTS

This study's sample includes all reported cases of statutory infectious diseases in Guangdong Province from June 2023 to May 2024, totaling 3,595,302 individuals. The cases encompass non-life-threatening contagious diseases, such as SARS, avian influenza, all types of hepatitis, dengue fever, tuberculosis, infections caused by the novel coronavirus, and influenza. A random sampling method was used, giving each person an equal chance of selection. This approach improved the sample's representativeness. The technique helped reduce bias and ensured the sample reflected the overall population. Sampling was conducted using an anonymized patient database provided by the Guangdong Provincial Health Commission. A computer-generated random number table ensured randomness of selection.

To ensure sample relevance and validity, the following inclusion criteria were applied: (a) a history of infectious disease, such as COVID-19, hepatitis, or tuberculosis; (b) use of an online medical platform for infectious disease consultation within the past year; (c) age of at least 18 years and the ability to complete the questionnaire independently; and (d) voluntary participation with signed informed consent. In strict adherence to ethical standards, informed consent was obtained before participants completed the questionnaire, and all data were anonymized and approved by the relevant ethics committee.

According to Yamane's sample size calculation formula[22], the required minimum sample size was at least 399. The number of questionnaires distributed was increased to account for invalid or unanswered responses. Based on Krejcie and Morgan's recommendation , and assuming a 60% response rate, the adjusted number of questionnaires to be distributed was approximately 665 (i.e., $399 / 0.6$).

A total of 665 questionnaires were distributed to patients with infectious diseases, yielding 563 valid responses for analysis. Data were collected using structured survey tools, and all procedures were conducted in accordance with ethical standards and approved by the relevant ethics committee.

The final sample description shows that 48.31% of respondents were male and 51.69% were female. Most participants were between 18 and 50 years old (84%, $M = 30.33$, $SD = 12.58$). Regarding education, 31.61% had a junior high school education or less, 25.58% were junior college students, and 42.81% were college students. Additional sociodemographic and academic details are provided in **Table 1**.

TABLE 1. SOCIODEMOGRAPHIC AND ACADEMIC CHARACTERISTICS OF THE SAMPLE.

Variables	N=563	%Sample
Gender		
Male	272	48.31%
Female	291	51.69%
Age		
Range	18-50	84%
Mean	30.33	
Education		
High school or less	178	31.61%
College	144	25.58%
University	220	39.08%
Master and above	21	3.73%
Monthly Income		
Less than 5,000 CNY	245	43.5%
5,000-10,000 CNY	223	39.6%
10,000-15,000 CNY	72	12.8%
More than 15,000 CNY	23	4.1%

ETHICS

This study was conducted in strict compliance with international ethical standards. Ethical approval was obtained from an institutional ethics committee in Guangdong Province, China. The approval reference number was not available, and all procedures adhered to the Declaration of Helsinki[24] and the Ethical Review Methods for Biomedical Research Involving Humans (National Health Commission of China, 2016)[25]. Given that participants were patients with infectious diseases (e.g., tuberculosis, hepatitis, HIV/AIDS), special safeguards were applied to protect this vulnerable group.

All participants provided informed consent after being fully informed of the study objectives, data use, privacy protection, and their right to withdraw at any time. Data were collected anonymously, securely stored with encryption and restricted access, and contained no personal identifiable information.

The study followed the GATHER reporting checklist, which is more suitable for cross-sectional observational research than CONSORT or SPIRIT. This ensured transparency in study design, data handling, and participant protection. A detailed mapping to the checklist is provided in Appendix A.

Due to ethical restrictions, raw datasets cannot be made publicly available. Still, de-identified summary data may be obtained from the corresponding author upon reasonable request and ethics committee approval.

MEASUREMENT INSTRUMENTS

The questionnaire had two sections. The first gathered demographic information. The second assessed core constructs—PD, PU, PEOU, and BI—using 15 items adapted from validated scales, rated on a 5-point Likert scale. Table 2 shows the measurement items.

TABLE 2. MEASUREMENT ITEMS OF CONSTRUCTS.

Construct	Variables	Measurement Items	Source
Perceived Ease of Use	PEOU1	I find the online consultation platform easy to use.	[26, 27]
	PEOU2	It is straightforward to locate the necessary information on the online consultation platform.	
	PEOU3	I can interact with doctors quickly through online consultation platforms.	
	PEOU4	It has become easier to seek medical advice for my health problems through the online consultation platform.	
Perceived Usefulness	PU1	The online consultation platform is highly effective in addressing my medical needs.	[26, 28]
	PU2	The online consultation platform enables me to receive medical consultation more quickly than at traditional hospitals.	
	PU3	The online consultation platform enables me to access medical services within a limited timeframe.	
	PU4	Using an online consultation platform helps me better understand how to manage my health.	
Psychological Distance	PD1	I would use the online consultation platform whenever I have concerns about my symptoms.	[16, 18, 29]
	PD2	If I lived in a remote area or found it difficult to visit a hospital, I would choose to use the online consultation platform.	
	PD3	I trust the doctors on the online consultation platform, even if I don't know them personally.	
	PD4	I believe online consultations can accurately diagnose and effectively treat my health issues.	
Behavioral Intention	BI1	I believe an online consultation platform is a valuable tool that is worth utilizing in the long term.	[26, 30]
	BI2	I am likely to continue using the online consultation platform in the future.	
	BI3	I would recommend the online consultation platform to others.	

STATISTICAL ANALYSES

Statistical analysis was performed in two phases. First, the reliability and validity of the measurement tool were evaluated. Reliability was measured using Cronbach's α , and validity was assessed through content and construct validity, as well as Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The model was deemed acceptable with factor loadings above 0.4, a KMO value greater than 0.6, and a significant Bartlett's test ($p < 0.05$). Correlations among variables were examined using Pearson's coefficient, and the mediating effect of psychological distance was tested with 5,000 bootstrap samples.

In the second stage, the SEM was constructed and estimated using the Maximum Likelihood method, along with 5,000 bootstrapped confidence intervals. SEM was used to examine both direct and indirect effects of psychological distance on user adoption behavior. Model fit was evaluated using multiple indices: non-significant chi-square ($p > 0.05$), RMSEA < 0.08 , SRMR < 0.06 , and CFI and TLI > 0.95 . All analyses were performed in SPSS 22.0 and AMOS.

RESULTS

THE MEASUREMENT MODEL ANALYSES

Reliability Analyses

The Cronbach's α analysis (Table 3) confirmed the survey results' reliability. All variables showed strong internal consistency, with PEOU (0.845), PU (0.853), PD (0.863), and BI (0.814), each exceeding the widely accepted threshold of 0.70. These findings demonstrate high reliability and support the validity of the questionnaire. Conversely, values below 0.70 generally indicate potential issues with item consistency on Likert scales.

TABLE 3. CRONBACH'S RELIABILITY ANALYSIS.

Variables	Number of items	Cronbach's α coefficient
PEOU	4	0.845
PU	4	0.853
PD	3	0.863
BI	3	0.814

Validity Analyses

The measurement model was assessed for reliability using Cronbach's α and Composite Reliability (CR), and for construct validity through CFA. Internal reliability was confirmed by the Cronbach's α coefficients listed in **Table 4**. The internal consistency of the latent constructs was further verified with CR after confirming that all standardized factor loadings exceeded 0.70. The CR values—each above 0.70—provided strong evidence of internal consistency, confirming the measurement model's solid reliability.

The KMO value was 0.887 ($p < 0.05$), significantly higher than the 0.60 threshold, indicating that the model is suitable for factor analysis. Convergent validity was assessed using the AVE, which measures the proportion of variance in a construct that is captured relative to measurement error. As shown in **Table 4**, all AVE values exceeded 0.50, confirming strong convergent validity. Additionally, VIF values for all constructs were below 2.2, indicating there is no significant multicollinearity.

TABLE 4. RELIABILITY AND VALIDITY.

Constructs	Loading Factor	CR	AVE	VIF
PEOU	0.618-0.705	0.799	0.665	1.940-1.992
PU	0.692-0.716	0.785	0.694	2.008-2.087
PD	0.686-0.724	0.803	0.658	2.042-2.188
BI	0.653-0.697	0.718	0.503	NA

CORRELATION ANALYSES

An analysis of the Pearson correlation matrix shown in Table 5 examined the relationships among PU, PEOU, BI, and PD. The results revealed statistically significant negative correlations between PD and PU ($r = -0.401$), PEOU ($r = -0.403$), and BI ($r = -0.413$). These coefficients indicate moderate inverse relationships, suggesting that as PD increases, the other variables tend to decrease in value.

Positive correlations were also observed: PU was positively related to PEOU ($r = 0.422$) and BI ($r = 0.417$), indicating that higher PU is linked to increased PEOU and a stronger BI. Additionally, a moderate positive correlation ($r = 0.363$) was found between PEOU and BI. These findings highlight the mutually reinforcing relationships among the three key constructs.

TABLE 5. OBSERVED VARIABLES CORRELATION COEFFICIENT. (N=563)

	PEOU	PU	PD	BI
PEOU	1			
PU	.422**	1		
PD	-.403**	-.401**	1	
BI	.363**	.417**	-.413**	1
MEAN	3.3	3.27	2.69	3.35
SD	1.215	1.227	1.222	1.219

KMO Measure of Sampling Adequacy = 0.943; Bartlett's Test of Sphericity Approx. Chi-square = 4266.553, df=105, $p = .000$

STRUCTURAL MODEL ANALYSES

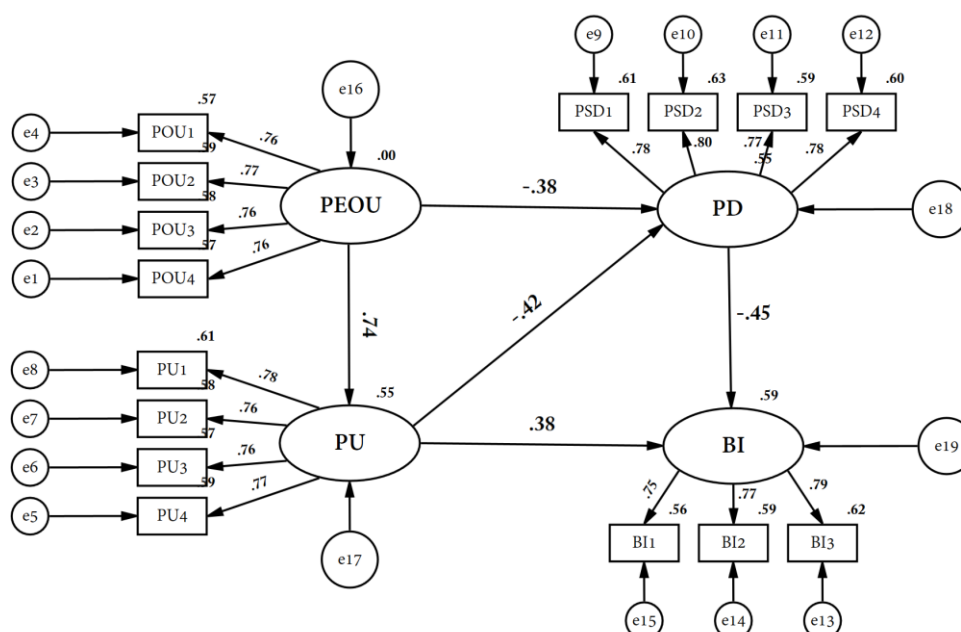
After confirming the measurement model's reliability and validity, the next step was to use the structural model to test the research hypotheses. The overall fit of the theoretical model was assessed using several indices, as shown in Table 6. The model demonstrated an excellent fit, with all fit indices meeting the required statistical standards.

TABLE 6. MODEL FIT

INDEX	NFI	RFI	IFI	CFI	GFI	AGFI	CMIN/DF	RMSEA
Value	0.980	0.975	0.999	0.999	0.979	0.971	1.047	0.009

The absolute fit indices, including CMIN/DF = 1.047 and RMSEA = 0.009 (90% CI [0.000, 0.025], PCLOSE = 1.000), indicate an excellent model fit with minimal residual variance. The incremental fit indices — NFI = 0.980, IFI = 0.999, CFI = 0.999 — show significant improvements over the null model. Additionally, the GFI (0.979) and AGFI (0.971) further support the model's strong fit. In summary, the model demonstrates an outstanding overall fit, effectively explains the observed data, and provides full support for the proposed theoretical framework.

FIGURE 2. PATH COEFFICIENTS FOR THE WHOLE MODEL.



Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Chi-Square=89.0, df=85, P-value=0.362, RMR=0.038

Figure 2 shows the results of the structural model. The analysis revealed that the following paths were significant: PU←PEOU ($t=13.743$, $\beta=0.748$), PD←PEOU ($t=-5.520$, $\beta=0.391$), PD←PU ($t=-6.153$, $\beta=-0.402$), BI←PD ($t=-7.093$, $\beta=-0.469$), and BI←PU ($t=6.036$, $\beta=0.402$). These findings support hypotheses H1 through H5. A summary of the hypothesis testing results is shown in Table 7.

TABLE 7. HYPOTHESIZED RELATIONSHIPS. *, P=0.001, 95% CONFIDENCE LEVEL.**

Hypotheses	Paths	t	β	p	Comments
H1	PU←PEOU	13.743	0.748	***	Supported
H2	PD←PEOU	-5.520	0.391	***	Supported
H3	PD←PU	-6.153	-0.402	***	Supported
H4	BI←PU	6.036	0.402	***	Supported
H5	BI←PD	-7.093	-0.469	***	Supported

MODERATED MEDIATION ANALYSES

A mediating variable acts as an intermediary process through which the effect of an independent (latent) variable is transmitted to a dependent variable. In this study, the Bootstrap method was used with SPSS to test for mediation effects. The empirical sampling distribution was employed to estimate the parameters. An iterative resampling process was conducted (N = 563, with 5,000 repetitions) to determine the 95% confidence interval.

The results presented in Table 8 show that the confidence intervals for both hypothesized mediating pathways do not include zero, and all associated p-values are below the 0.05 significance level. This verifies that the mediation effects are both valid and statistically significant.

TABLE 8. BOOTSTRAPPED MEDIATION ANALYSIS

Mediation Path	Corresponding	Estimate(β)	Lower	Upper	P
PEOU-PD-BI	H6	0.1290	0.0909	0.1716	p<0.0001
PU-PD-BI	H7	0.1171	0.0784	0.1601	P<0.0001

Specifically, psychological distance acts as a mediator in the relationships between perceived usefulness, perceived ease of use, and the intention to adopt. Therefore, Hypotheses 6 and 7 are supported. These results enhance the understanding of how these key factors interact and influence each other, confirming the validity of the TAM in this research context. Furthermore, all hypotheses were tested and confirmed within the framework of the CLT. According to the structural equation model analysis, the model fits the data well and has strong explanatory power.

DISCUSSION

This study combines TAM with CLT to examine how PD influences telemedicine adoption. The results indicate that PD is not merely a fixed background factor; instead, it functions as an active psychological regulator that affects the pathway from PU and PEOU to BI through trust and anxiety.

PD plays a dual role in changing how people see technology into their behavioral intentions. Cutting down on time and space (for example, instant consultations, online prescriptions, home care) reduces mental effort and increases PEOU. At the same time, shrinking social and situational gaps (such as clear physician credentials and patient review systems) help build trust and ease anxiety, which boosts the effect of PU on BI. The different effects across the four PD dimensions highlight the importance of considering PD as a multidimensional concept rather than a single idea.

THEORETICAL CONTRIBUTIONS

This research contributes to existing literature in three keyways:

1. Validation: In high-risk healthcare settings, TAM's main mechanisms stay strong, with PU and PEOU serving as key factors in telemedicine adoption.
2. Extension: By incorporating CLT, the study shows the mediating role of PD and its different aspects, addressing TAM's narrow focus on psychological mechanisms.
3. Reconceptualization: PD is redefined from a static outcome to a dynamic driver, resulting in a three-stage framework—cognition, psychological mechanisms, and behavioral intention—that offers a more detailed explanation of digital health adoption.

LIMITATIONS

Several limitations of this study should be acknowledged. First, the sample was limited to Guangdong Province, which may restrict how broadly the findings apply. Second, the cross-sectional design and reliance on self-reported data may introduce recall and social desirability biases, particularly in the sensitive context of infectious diseases, which can prevent firm causal conclusions. Third, potential confounding factors such as digital skills, prior telemedicine experience, socioeconomic status, and platform reputation were not considered. Future research could address these limitations by employing longitudinal or multi-wave designs to examine the stability of psychological distance mechanisms over time, incorporating behavioral or platform usage data to supplement self-reports, and utilizing experimental manipulations of psychological distance to provide stronger causal evidence. Despite these limitations, the study offers valuable theoretical and practical insights, and these suggested directions give a clear roadmap for future research to enhance causal claims and expand empirical validation.

CONCLUSIONS

By combining TAM and CLT, this study highlights the crucial role of PD in the adoption of telemedicine. PU and PEOU remain key factors, while PD affects their influence on BI through trust and anxiety, showing apparent differences across dimensions. These findings enhance the understanding of health technology adoption and offer a flexible psychological framework for a broader range of digital adoption scenarios.

From a practical perspective, telemedicine platforms should enhance usability, transparency, and trust while strategically lowering psychological barriers to improve user experience. Policymakers should support insurance coverage, set clear legal and technical standards, and invest in digital infrastructure, all while addressing users' psychological needs and cultural differences to encourage adoption and ensure the long-term success of telemedicine services.

AUTHORSHIP STATEMENT

All authors of this paper have agreed to submit it for review and meet the authorship criteria, including substantial contributions to the conception, design, execution, methodological input, data analysis, and interpretation of the study. All authors have reviewed and approved the final version of the manuscript and confirmed the appropriateness of the authorship order.

ACKNOWLEDGEMENTS

This study did not receive any external funding. Special thanks to Tongjai Yampaka for providing professional advice, whose contributions were essential to this research. The primary author has obtained permission from all acknowledged individuals.

CONFLICT OF INTEREST STATEMENT

The authors declare no financial or personal conflicts of interest that could influence this study.

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APPENDIX A

GATHER CHECKLIST MAPPING FOR THIS STUDY

GATHER Item	Description	Where Reported
1. Objectives	Clearly state the research objectives and questions	INTRODUCTION, MATERIALS AND METHODS
2. Study Design	Specify the type of study (cross-sectional online survey)	MATERIALS AND METHODS PARTICIPANTS
3. Data Sources	Describe data sources (online questionnaire, patient recruitment channels)	PARTICIPANTS
4. Participants	Eligibility criteria, inclusion/exclusion rules, and sample size	PARTICIPANTS
5. Data Collection Methods	Explain how the data were collected (online platform, timeframe)	PARTICIPANTS
6. Data Processing	Handling of missing data, cleaning procedures, and anonymization	MATERIALS AND METHODS
7. Ethical Safeguards	Ethical approval, informed consent, and protections for vulnerable groups	PARTICIPANTS ETHICS
8. Risk of Bias	Measures taken to minimize bias (sampling strategy, survey design)	PARTICIPANTS MEASUREMENT INSTRUMENTS
9. Limitations	Limitations of the study and implications for interpretation	DISCUSSION
10. Data Availability	Statement on data sharing and access restrictions	ETHICS

AN ANALYSIS OF CLAIMS ADJUSTMENT PROCESSES IN GEORGIA'S HEALTH INSURANCE SECTOR: QUALITATIVE STUDY

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ABSTRACT

OBJECTIVE:

Efficient management of insurance claims is essential for the financial stability of the healthcare system. This study aims to examine the challenges and systemic issues that affect health insurance claims management and to identify areas for operational improvement.

METHODOLOGY:

A qualitative research design was employed, supported by quantitative claims data to ensure methodological triangulation. Twelve in-depth semi-structured interviews were conducted with managers and administrative staff from a leading Georgian private insurance company and affiliated healthcare providers. Interview transcripts were thematically analyzed through an inductive–deductive coding process, informed by transaction cost and principal–agent theories. Quantitative data from the insurer's 2022–2024 internal claims database were analyzed using descriptive statistics to identify trends in submission, correction, and revision. Triangulation between qualitative themes and quantitative indicators served as a validation strategy.

RESULTS:

The qualitative analysis revealed recurring themes related to administrative inefficiency, communication barriers, and contractual non-compliance. Key themes included: (1) incomplete or inconsistent documentation leading to claim adjustments; (2) weak coordination and information sharing between insurers and providers; and (3) tolerance of deadline and pricing violations for high-demand clinics to maintain service continuity. Quantitative results showed that approximately 2% of all claims required correction or revision, primarily due to documentation and referral issues. Hospitals accounted for the majority of claims and adjustments.

CONCLUSION:

The study highlights significant operational inefficiencies and communication gaps in Georgia's health insurance claims process. The lack of standardized documentation protocols, reliance on manual systems, and frequent breaches of contract terms all contribute to delays, disputes, and financial strain for both insurers and providers. To improve claims management in Georgia, the process should be digitized and documentation standardized to reduce errors. Staff training must be strengthened, and regulatory oversight enhanced through performance-based contracts.

KEYWORDS

Health insurance, claims management, medical documentation, contract compliance, insurance providers

INTRODUCTION

Health insurance plays a critical role in protecting individuals and families from the financial risks associated with medical care. In both developed and developing countries, the effectiveness of insurance systems depends heavily on how efficiently claims are managed and processed. Efficient claims management not only ensures the financial sustainability of insurance providers but also directly affects the accessibility, quality, and timeliness of healthcare services received by insured individuals [1, 2].

Claims management typically involves the submission, verification, adjustment, and reimbursement of medical expenses incurred by policyholders. At the core of this process is the claim adjustment stage, during which insurance companies review and validate submitted claims to determine their eligibility for payment. While this process is vital for fraud prevention and financial control, it often leads to disputes and delays, particularly when documentation is incomplete, policies are unclear, or contractual terms are not adhered to [3, 4].

Global evidence shows that paper-based and poorly integrated claims systems are consistently associated with higher administrative costs, slower reimbursement, and larger volumes of corrected or rejected claims. Studies and policy reports from multiple settings demonstrate that digital claims platforms and standardized billing rules lower rejection rates and shorten payment cycles, improving provider liquidity and overall efficiency. Comparable experiences from Europe and Central Asia likewise document the administrative challenges that accompany transitions to social or mixed insurance models: countries that invested early in interoperable claims systems (for example, some Baltic states and selected European funds) observed measurable reductions in manual corrections and audit workloads [5].

There is also a growing literature from countries with transitional health systems –Armenia, Ukraine, Kazakhstan, and Moldova, that highlights how uneven implementation of purchasing rules and weak information flows increase transaction costs between payers and providers and can incentivize informal coping behaviors by clinics [6]. Country reports and analytic papers point to the same proximate drivers we observe in Georgia (documentation errors, referral irregularities, and contract compliance problems) while also showing how different policy choices (strategic purchasing, investment in digital infrastructure, stronger regulatory oversight) have produced divergent outcomes [7].

Bringing comparative evidence from post-Soviet and lower-middle-income countries into conversation with Georgian data has three advantages. First, it helps distinguish which problems are technical (fixable by digitization and training) versus structural (rooted in financing design, provider incentives, or regulatory gaps). Second, it provides practical pathways for reform: countries that paired standard billing formats with electronic submission portals and clear contracting rules saw rapid declines in simple documentation-based corrections [8]. Third, regional comparisons underscore governance lessons, how purchaser capacity, transparency in contracting, and credible enforcement mechanisms reduce adversarial disputes and litigation over claims [9].

In Georgia, where mixed public–private financing and a growing role for private insurers coexist with state-funded programs, efficient claims processing has direct implications for provider cash flow, insurer solvency, and patient access to care. These challenges are compounded by limited digital infrastructure, inconsistent standards across medical providers, and weak regulatory oversight. A study of insurance claims management in similar contexts has shown that delays in reimbursement and high rates of claim correction often stem from inadequate communication, disorganized medical records, and non-standardized billing systems [10, 11]. These inefficiencies undermine provider-insurer relationships, reduce patient trust, and contribute to systemic instability in healthcare financing.

In Georgia, the relationship between insurance companies and medical institutions is governed by contractual agreements that outline service costs, deadlines, and documentation protocols [12, 13, 14]. However, frequent breaches of these agreements, along with disputes over pricing and service coverage, have led to an increase in adjusted and

rejected claims. Insurance companies also face difficulties managing claims from a growing number of contracted medical providers, many of which operate with varying administrative capacities.

Given these challenges, it is essential to examine the mechanisms, behaviors, and systemic factors that affect the performance of the claims management process in Georgia. Understanding the root causes of inefficiencies can help identify strategies for improvement, reduce delays in payment, and strengthen the overall health financing system.

Although past research has described broad health-financing transitions in post-Soviet countries, there is limited empirical evidence focusing specifically on the micro-level administrative mechanics of claims adjustment in Georgia. Existing overviews of the region highlight persistent problems, fragmented information systems, uneven administrative capacity across providers, and unpredictable reimbursement timetables, but they rarely link these system-level features to concrete claims correction rates, revision drivers, or insurer-provider dispute processes. This paper fills that gap by (1) documenting the frequency and monetary value of adjusted and revised claims in a major Georgian insurer's portfolio; (2) identifying the operational causes of adjustments (documentation gaps, invalid referrals, coding inconsistencies, deadline breaches); and (3) situating these findings within broader regional experiences and policy options (digitalization, standardization, and governance reform).

The aim of this study is to analyze the claims adjustment process within Georgia's insurance sector, explore the reasons for claim revisions and delays, and identify institutional and systemic barriers that hinder efficient claims management. By combining qualitative insights with claims data from 2022 to 2024, this research seeks to generate practical recommendations for improving the accuracy, speed, and transparency of insurance reimbursement processes.

THEORETICAL FRAMEWORK

This study is grounded in the intersection of health systems theory, organizational transaction cost theory, and claims management principles from the field of insurance economics. These theoretical perspectives help explain the dynamics between insurers and healthcare providers, as well as the administrative and structural factors that influence claim processing outcomes.

HEALTH SYSTEMS THEORY

According to the World Health Organization (WHO), health systems are comprised of all organizations, institutions, and resources whose primary purpose is to improve health. Effective health systems must ensure access, quality, and efficiency of services while maintaining financial protection. Claims management is a core function of the financing sub-system, where proper documentation, timely reimbursements, and compliance with contractual agreements are essential for sustainability and trust. Weaknesses in administrative functions, such as delays, documentation errors, or inconsistencies in reimbursement, undermine overall system performance and user satisfaction [15].

TRANSACTION COST THEORY

Rooted in organizational economics, transaction cost theory (Williamson, 1981) posits that economic exchanges between organizations, such as between insurers and providers, are shaped by efforts to minimize the costs of coordination, negotiation, and enforcement of contracts. In the context of Georgia's health insurance sector, frequent adjustments and disputes over claims reflect high transaction costs, resulting from incomplete documentation, asymmetry of information, and unclear contractual terms. These costs are further amplified when standardized digital systems are lacking and when institutional capacity varies across providers.

CLAIMS MANAGEMENT AND RISK CONTROL THEORY

Within the insurance industry, claims management theory emphasizes the need for risk containment, fraud prevention, and efficiency in resource allocation. Claims adjustment serves not only to ensure that payments align with contractual terms and medical necessity, but also to prevent financial loss due to overuse, errors, or abuse. However, excessive scrutiny or inefficiencies in processing can result in delays and dissatisfaction. A balance must therefore be struck between control mechanisms and service quality.

PRINCIPAL-AGENT THEORY

This framework is also relevant in analyzing insurer-provider relationships. The insurance company (principal) relies on healthcare providers (agents) to deliver services to insured patients according to agreed terms. However, information asymmetry and divergent incentives often lead to agency problems, such as upcoding, provision of unnecessary services, or documentation manipulation, which in turn necessitate claim audits, adjustments, and at times legal review. Monitoring systems and incentive alignment are crucial to resolving such inefficiencies.

ANALYTICAL INTEGRATION

Together, these frameworks established the logic underpinning the study's methodological choices and interpretive approach. Transaction cost and principal-agent theories informed both the design of the semi-structured interview guide and the coding scheme used in thematic analysis, ensuring that observed operational challenges were interpreted in relation to coordination costs, incentive structures, and monitoring limitations. Health systems theory provided a broader policy and institutional context, while claims management theory grounded the analysis in measurable efficiency criteria. This combined framework enabled the study to move beyond description toward an explanatory understanding of why and how administrative inefficiencies persist in Georgia's insurance claims management process.

METHODS

RESEARCH DESIGN

Given the exploratory nature of this research, a qualitative design was employed to capture the perspectives, practices, and operational challenges of health insurance claims management in Georgia. To ensure data validation and depth, the study integrated quantitative claims data analysis within a qualitative framework (methodological triangulation). This combination enhanced credibility by aligning administrative data with respondent narratives.

DATA SOURCES AND SAMPLING

Qualitative data were collected through twelve semi-structured, in-depth interviews with insurance company managers, claims adjusters, and administrative staff from affiliated medical institutions. Participants were purposively selected based on their direct involvement in claims processing, auditing, and provider relations. Data collection continued until thematic saturation was reached, that is, when subsequent interviews produced no new insights or themes. Saturation was achieved after the tenth interview, with two additional interviews conducted to confirm stability of themes.

Quantitative data were obtained from the internal archives of a leading private insurance company in Georgia. These administrative records, used with company permission, covered all processed claims from January 2022 through December 2024. Inclusion criteria consisted of completed claims submitted within this period across hospital, outpatient, dental, and pharmacy services. Incomplete, duplicate, or pending claims were excluded from analysis. The dataset was de-identified prior to transfer to the research team, ensuring confidentiality and data security.

DATA COLLECTION INSTRUMENTS

The interview guide included questions on: (a) criteria for contracting providers, (b) causes of claim corrections and revisions, (c) documentation standards and communication protocols, (d) challenges in meeting reimbursement deadlines, and (e) perceptions of digitalization and administrative efficiency. Each interview lasted 50–60 minutes and was audio-recorded with participant consent. Transcripts were anonymized before analysis.

DATA ANALYSIS

Interview transcripts were analyzed using thematic content analysis, guided by a hybrid inductive–deductive approach. Initial deductive codes were derived from the theoretical frameworks (transaction cost and principal-agent theories), while additional inductive codes emerged during iterative reading of transcripts. Coding and theme development were performed by two independent researchers, who compared interpretations and discussed discrepancies until consensus was reached. Inter-coder reliability was reinforced through peer debriefing sessions and cross-checking of coded segments. Quantitative claims data were analyzed descriptively to identify the frequency and proportion of adjusted and revised claims, providing contextual validation for qualitative findings.

TRIANGULATION AND CREDIBILITY

Triangulation was applied across data sources (interviews and claims data) and analytical levels to enhance validity. Converging evidence between administrative trends and interview themes was treated as confirmatory, while inconsistencies guided further interpretive analysis. Peer debriefing and reflexive memoing were used to mitigate researcher bias and maintain analytic transparency.

ETHICAL CONSIDERATIONS

Ethical approval was granted by the Ethics Council of Caucasus University (CAU No. 018/24). Written informed consent was obtained from all participants after they were briefed on the study's objectives and confidentiality procedures. Audio recordings, transcripts, and administrative data were stored on a password-protected institutional drive accessible only to the core research team. All identifying information was removed from transcripts, and de-identified data were retained solely for analysis purposes.

RESULTS

The analysis drew on both interview data and a proprietary claims dataset obtained directly from the internal records of a leading private insurance company operating in Georgia. The dataset was used with permission from the company's management and de-identified before analysis to ensure confidentiality. It included all processed claims from January 2022 through December 2024 and covered hospital, outpatient, dental, and pharmacy services. These records represented administrative data routinely collected for internal auditing and financial reporting purposes, rather than a national or publicly accessible health database. Clarifying the origin of this dataset enhances transparency regarding data reliability and contextual scope—it reflects the operational realities of one major insurer within Georgia's mixed health-financing environment.

Between 2022 and 2024, over 1.28 million claims totaling approximately 58.2 million GEL were submitted by hospitals. Of these, around 1.8% were adjusted and 0.4% revised, resulting in 97.8% of the total being reimbursed. Hospitals accounted for the majority of both claims and adjustments. (Table 1; Table 2).

TABLE 1 - CLAIMS SUBMITTED AND ADJUSTED BY SERVICE TYPE, 2022–2024

	The total value (GEL)	Subject to correction	Subject to revision	Paid amount (GEL)
Hospital	31,223,231	380,413	30,133	30,812,685
Ambulatory	6,141,813	35,654	11,804	6,094,355
Dentistry	3,945,734	25,589	0	3,920,145
Pharmacy	16,821,739	590,573	175,016	16,056,150
Total	58,132,517	1,032,229	216,953	56,883,335

TABLE 2 - REASONS FOR ADJUSTMENT, (IN GEL) (2022-2024)

Reason Type	Adjustment Value	Percentage
Discount	97,123	9.3%
Late Submission	241,643	23.2%
Documentation Error	663,534	63.7%
Other	39,342	3.8%
Total	1,041,642	100%

IN-DEPTH INTERVIEW RESULTS

The qualitative data provide context to the quantitative findings and explain why certain claim types are more prone to correction or delay.

THE VALUE OF EXPANDING PROVIDER NETWORKS

Participants consistently emphasized the strategic role of maintaining a broad provider network to improve access and manage financial risk. A diverse network allows patients flexibility in choosing healthcare facilities, improves satisfaction, and gives insurers leverage in negotiating service prices and reimbursement schedules. Respondents noted that wide networks also facilitate deferred payments, which help insurers manage liquidity.

Key Advantages of Multiple Provider Networks:

- **Improved Access and Flexibility:** A diverse provider network enables insured individuals to access a broad spectrum of healthcare services, including specialized care. This ensures patients can choose facilities based on convenience, medical need, or geographic proximity.
- **Enhanced Customer Satisfaction:** Greater provider choice contributes to higher patient satisfaction by allowing policyholders to seek care from clinics that best meet their personal preferences and service expectations.
- **Network Adequacy and Service Availability:** Maintaining a sufficient number of contracted clinics ensures adequate coverage and helps prevent service delays due to long wait times or provider unavailability.
- **Cost Control and Deferred Payments:** By entering into contractual agreements with multiple providers, insurance companies can negotiate favorable service rates and defer reimbursements, thus improving cash flow and budgeting.

"There are several reasons why it is important for an insurance company to maintain a wide network of provider clinics. First, it ensures greater access to care, allowing policyholders to choose from various providers based on location, specialization, and availability. This variety enhances satisfaction and service quality. Moreover, a broader network helps maintain adequate coverage and reduces wait times. From a financial standpoint, it allows insurers to negotiate discounted rates and enter cost-sharing agreements, generating savings for both the insurer and the insured."

Respondent I

"As a financial entity, an insurance company is primarily focused on managing risks and costs. Having multiple contracted providers is advantageous in that it allows insurers to control the timing of payments. If a policyholder uses a provider clinic, reimbursements are processed according to contractual timelines—often delayed by one to two months—rather than requiring immediate reimbursement, as is the case with non-contracted clinics. Furthermore, a broad provider network enables insurers to better meet the diverse needs of their policyholders."

Respondent II

"A wide network of provider clinics gives policyholders valuable options in terms of medical specialization, service quality, and geographic accessibility. This variety not only improves patient experience but also strengthens the insurer's ability to deliver responsive and comprehensive healthcare coverage."

Respondent IV

CRITERIA FOR CONTRACTING MEDICAL INSTITUTIONS

Interviewees identified several key criteria for contracting medical institutions, including geographic accessibility, range of services, quality assurance mechanisms, and compliance with national healthcare standards. Providers demonstrating accreditation, strong patient satisfaction scores, and operational transparency were prioritized for contracting.

"Insurance companies typically assess several key factors before entering into contractual agreements with medical providers. While these may vary depending on the strategic goals of each insurer, certain core criteria are generally observed across the industry"

Respondent IX

"First and foremost, insurers evaluate whether a medical facility is capable of meeting the healthcare needs of their insured population. This includes assessing the institution's geographic reach, range of services, and its ability to provide timely and efficient care. A critical objective is to ensure that the provider network includes a diverse mix of clinics and hospitals that can offer comprehensive services across different regions."

Another major consideration is the quality of care delivered by the medical institution. This involves reviewing credentials such as accreditation status, clinical certifications, treatment outcomes, and performance in patient satisfaction surveys. Additionally, insurers assess the provider's compliance with national healthcare standards and regulatory requirements."

Respondent XII

"Overall, insurance companies prefer to collaborate with medical organizations that demonstrate a strong commitment to service quality, operational transparency, and the capacity to serve patients effectively. These criteria help maintain the credibility of the insurer's provider network and ensure that policyholders receive reliable and professional medical services."

Respondent IV

REASONS FOR CLAIM ADJUSTMENTS

The analysis of interview responses revealed several recurring causes behind claim adjustments initiated by insurance companies. These adjustments often stem from administrative inconsistencies, procedural errors, or documentation deficiencies on the part of healthcare providers.

Key Reasons for Claim Adjustments:

- Incomplete or disorganized documentation;
- Use of invalid or outdated referral forms;
- Missing patient identification materials;
- Diagnostic discrepancies;
- Rapid rehospitalization of the same patient across multiple facilities;
- Incorrect or missing notification to the insurer in urgent cases;
- Application of discounts not reflected in the claim

"The most common reasons for correcting the amounts submitted by medical institutions include failures in the notification process, especially in urgent cases where either no message is sent to the insurer or the message is incorrectly issued. Additionally, discrepancies may arise from billing corrections due to discounts that were not properly documented or communicated during the submission."

Respondent X

"Claim adjustments frequently occur due to a variety of administrative and procedural shortcomings. These include incomplete supporting documentation, the use of expired or invalid referral forms, and the absence of necessary identity verification documents. Other common issues involve mismatches between the diagnosis and the services provided, or cases where a patient is transferred or rehospitalized within a short time frame between different medical institutions, which often triggers a reassessment by the insurer."

Respondent III

REASONS FOR DELAYED PAYMENTS FOLLOWING CLAIM ADJUSTMENTS

Delays in reimbursement often occur after claims are flagged for adjustment. Based on the interviews, these delays are primarily attributed to extended clarification processes, internal audits, and, in more complex cases, legal proceedings.

Common Causes of Payment Delays Post-Adjustment:

- Extended back-and-forth communication regarding justifications from medical institutions;
- On-site audits to verify the accuracy of documentation and services provided;
- Escalation of unresolved cases to legal departments and courts.

"Medical institutions are generally motivated to respond promptly to any adjustments raised by insurers in order to receive compensation within the contractually agreed timeframe. However, if the insurer finds the facility's explanation insufficient or requires further verification, the reimbursement timeline may be extended. In some cases, these 'problem claims' may remain unresolved for two or three months—or even longer—depending on the complexity of the issue."

Respondent XI

"When clarification between the insurer and the medical institution proves unsuccessful, the matter is escalated to the audit department. Auditors may conduct on-site reviews of the medical history to verify the legitimacy of the claim. If consensus is still not achieved, the case is handed over to the legal department for further evaluation. In certain cases, disputes reach the court system, including the Supreme Court, which significantly prolongs the reimbursement process."

Respondent VIII

HANDLING OF PERFORMANCE SUBMISSIONS AND DEADLINE VIOLATIONS

Timely submission and processing of medical service documentation are critical components of the claims management process. Both insurance companies and medical institutions rely on strict adherence to contractually defined deadlines to ensure operational efficiency and financial predictability. Interview findings show that failure to comply with these terms can trigger significant administrative consequences and affect contractual relationships. Thus, insurers and providers reserve the right to reject claims or terminate contracts in response to missed deadlines. Delays in documentation submission or payment can lead to strained relations and administrative escalation.

"Insurance companies are entitled to reject documentation submitted by medical institutions if it falls outside the deadlines established in the contract. This enforcement mechanism ensures compliance and discourages operational delays. Conversely, if the insurer fails to process payments on time, the medical institution has the right to request clarification, demand a detailed report, and—if deemed necessary—initiate termination of the contract. Such clauses are typically included to protect the interests of both parties and maintain accountability within the reimbursement process."

Respondent IV

FREQUENCY OF CONTRACT VIOLATIONS

Contract breaches between insurance companies and medical institutions are not uncommon. While such violations can undermine trust and cooperation, they are sometimes tolerated, particularly when involving clinics that are highly preferred by insured clients. The interviews highlighted a nuanced reality in which contractual discipline is balanced against practical service delivery needs. Contract breaches occur regularly, especially regarding deadlines and pricing. Violations are often overlooked when dealing with high-demand or strategically important providers. Both parties generally aim to maintain transparency and mitigate the impact of such breaches.

"Any breach of contractual terms can significantly affect the relationship between the insurer and the healthcare provider. As a result, both sides make efforts to keep each other informed at every stage of the process. When violations do occur, they typically attempt to resolve the issue constructively, taking into account the mutual importance of the partnership."

Respondent I

"Deviations from agreed deadlines and pricing are quite common and usually identified during ongoing operations. Although formal terms exist, real-time pressures and case-specific considerations often lead to non-compliance, which is managed case by case."

Respondent III:

"Strict adherence to contract terms can be challenging, especially when the clinic in question is popular with insured clients. In such cases, violations are more likely to be tolerated in order to maintain continuity of care and avoid patient dissatisfaction."

Respondent VI

MAIN REASONS FOR CORRECTIONS IN SUBMITTED DOCUMENTATION

One of the most frequent triggers for claim adjustments is the submission of incomplete or incorrect documentation by medical institutions. These documentation issues disrupt the claims review process and often result in delays, corrections, or payment denials.

Common Documentation Issues:

- Missing or incomplete information
- Inaccurate or inappropriate diagnoses

- Duplicate submissions or conflicting records
- Late submissions beyond agreed deadlines

"Documentation corrections occur for a variety of reasons, but the most common include missing or incomplete information, mismatches between diagnoses and treatments, duplicate data entries, and failure to meet submission deadlines. These errors hinder the smooth processing of claims and often necessitate follow-up."

Respondent II

"Identifying the cause of documentation errors is generally straightforward. In many cases, the issue arises from simple confusion or oversight. When this happens, we allow the responsible party to submit corrected documentation so that the claim can proceed without further complications."

Respondent VI:

COMPLEXITY OF REVISION CASES

Claim revisions are typically initiated when submitted documentation lacks clarity or raises questions during the insurer's internal review. These cases are considered more complex due to the additional verification steps they require and their potential to delay reimbursement.

Key Characteristics of Complex Revisions:

- Triggered by ambiguous, inconsistent, or incomplete documentation
- Often necessitate on-site audits by the insurance company
- Involve extended investigation to validate the accuracy of the claim

"When any member of the insurance company's team identifies inconsistencies or has doubts about the submitted documentation, a revision process is initiated. In such cases, auditors are dispatched to the medical facility to conduct an in-depth, on-site review. This ensures that the claim is thoroughly examined before any final decision on reimbursement is made."

Respondent III

DISCUSSION

This study investigated the operational challenges associated with health insurance claims management in Georgia, with particular attention to the adjustment and reimbursement processes between insurers and healthcare providers. The findings highlight a complex system marked by administrative inefficiencies, delayed payments, contract violations, and recurring disputes, all of which compromise the effectiveness of the country's health insurance system.

Between 2022 and 2024, over 1,282,000 cases were submitted to a major insurance company, with a total claimed value exceeding 58 million GEL. Of this amount, approximately 1.78% (1,041,642 GEL) was subject to correction, and 0.37% (216,953 GEL) was marked for revision, indicating that nearly 2.2% of total claims required additional administrative processing before reimbursement. Hospitals accounted for the highest share of both claim submissions and adjustments, representing over 50% of all claims submitted annually during the period studied.

The most frequent reasons for adjustments included incomplete documentation, invalid or outdated referrals, diagnosis inconsistencies, and missed submission deadlines. A finding consistent with previous research on claims inefficiencies in similar healthcare settings [16, 17]. These administrative shortcomings not only delay payments but also undermine financial predictability for medical institutions, especially those heavily reliant on private insurance reimbursements alongside state funding [18].

Respondents also emphasized the strategic importance of maintaining broad provider networks. Such networks increase access to care, reduce wait times, and enhance customer satisfaction. As Respondent I noted, "a wide network ensures policyholders can choose the clinic that best suits their needs," while Respondent II pointed out that contractual

arrangements with providers allow insurers to defer reimbursements, improving their cash flow. This is in line with international findings on network adequacy and cost control strategies in insurance management [19].

However, the breadth of provider networks also contributes to inconsistency in contract compliance. According to the interviews, violations of submission deadlines and pricing agreements are common, especially among clinics that are popular with insured patients. While such breaches are often tolerated to preserve patient satisfaction and service continuity, they erode accountability and introduce financial risk. Respondent III acknowledged that "strict adherence to contract terms is difficult when the provider is in high demand," illustrating how patient preferences can influence operational discipline.

A particularly problematic area is the handling of revision cases. These cases are triggered when documentation is ambiguous or questionable, often requiring on-site audits and even legal review. Such cases can delay compensation by two to three months or longer, and in some instances, are escalated to the Supreme Court, further complicating the process. This finding reflects broader trends in insurance systems globally, where dispute resolution and fraud prevention are major challenges in claims processing [20, 21, 22].

The absence of an integrated digital infrastructure further exacerbates inefficiencies. Manual data entry, lack of real-time claim tracking, and disjointed communication between insurers and providers contribute to frequent errors and administrative backlogs. This aligns with previous studies calling for the adoption of mobile and automated claims management solutions in emerging markets [23, 24].

This study's findings should be read in light of the broader literature on post-Soviet health system transitions and the evolving purchaser-provider relationships in the region. Since independence Georgia moved away from the Semashko inheritance toward decentralized provision and a mixed public-private financing model. Country reviews and Health Systems in Transition (HiT) reports document rapid privatization, the introduction of purchaser-provider splits, and efforts to broaden coverage through strategic purchasing, while also noting persistent administrative and governance weaknesses [25]. These longer-run institutional legacies help explain operational patterns observed in our data, including fragmented documentation practices, variable contracting discipline, and heterogeneous provider administrative capacity [26].

Comparative studies of former Soviet republics and similar transition settings reveal recurring problems that align closely with our findings. The shift from highly centralized administrative control to more diversified purchaser and provider arrangements frequently produced gaps in purchaser capacity, weak oversight, and limited interoperability of information systems. In many countries in the region this has translated into high transaction costs, predominantly manual claims workflows, and recurring payer-provider disputes that impede efficient reimbursement and weaken the prospects for strategic purchasing. Conversely, the literature also documents successful reform pathways, often combining interoperable claims systems, standardized billing rules, and strengthened purchaser governance, that reduced simple documentation errors and enabled more advanced purchasing instruments [27].

Trust between insurers and medical institutions also emerged as a key issue. Disputes over reimbursement rates, delayed responses, and opaque adjustment processes undermine the working relationship. As Bes et al. (2013) highlight, effective claims management depends not only on clear contractual frameworks but also on mutual trust, ongoing communication, and shared incentives [28].

Formal contractual provisions and auditing rules are necessary, but they are not sufficient. Where mutual trust is low, actors respond with defensive behaviors (excessive documentation, frequent appeals, or protracted audits), which increase administrative workloads and prolong payment cycles. Where trust and predictable communication channels exist, characterized by shared claim-tracking tools, routine case reviews, and clear escalation protocols, insurer-provider interactions become more cooperative and less adversarial. These relational features reduce information asymmetries, speed up dispute resolution, and lower transaction costs.

Situating the Georgian experience in this regional context suggests several interrelated policy levers. First, digitization of claims submission and common billing formats are critical enablers, but only when combined with purchaser capacity strengthening (contract design, monitoring, and transparent dispute resolution). Second, formalized communication channels, regular liaison meetings, joint audit protocols, provider help-desks, and shared dashboards, convert adversarial contractual relations into collaborative problem-solving. Third, rules that increase transparency (public or shared audit criteria, clear timelines, and predictable penalties) reduce the scope for arbitrary enforcement and enhance predictability of reimbursements.

When interpreted through the post-Soviet transition literature and the governance lens above, the proximate causes of adjustments identified in our data (documentation errors, invalid referrals, and deadline breaches) are partially symptoms of deeper institutional features: fragmented IT systems, legacy administrative cultures, and enforcement asymmetries. The practice of tolerating contract violations by popular, high-volume providers reflects a pragmatic policy trade-off between strict enforcement and continuity of patient access—a trade-off also documented in other transitional systems. Therefore, successful reform must combine operational investments (training, digital platforms) with governance reforms that make contracts more credible, transparent, and enforceable..

CONCLUSION

This study provides an in-depth exploration of the operational and systemic challenges shaping health insurance claims management in Georgia. Drawing on interviews with insurance and healthcare personnel, as well as analysis of claims data from 2022–2024, the findings reveal that incomplete documentation, invalid referrals, and inconsistencies in diagnosis coding remain the primary causes of claim adjustments and payment delays. The persistence of manual documentation systems, limited interoperability between insurers and providers, and frequent breaches of contractual obligations exacerbate inefficiencies and financial uncertainty for both parties.

The study highlights that while the existence of multiple provider networks enhances access and patient satisfaction, it also increases administrative complexity and disputes over reimbursement. Prolonged claim reviews and the lack of standardized protocols further extend payment timelines, undermining trust and predictability in insurer–provider relationships.

These findings underscore the need for systemic reforms that strengthen administrative capacity, standardize documentation, and foster transparency in contractual enforcement. Addressing these challenges requires coordinated action between insurers, providers, and policymakers to establish a more reliable, efficient, and equitable claims management process within Georgia's evolving healthcare financing system.

Based on the findings of this study, several measures are recommended to improve the efficiency and transparency of claims management in Georgia's health insurance system.

First, the adoption of standardized digital documentation systems is essential to minimize errors related to incomplete or inconsistent records. Integrating hospitals and insurers into a unified electronic claims platform would reduce manual processing time and improve data accuracy.

Second, capacity building and continuous training should be provided for both insurance and healthcare administrative staff. Strengthening procedural knowledge and communication skills would help ensure compliance with contractual obligations and promote smoother coordination between institutions.

Third, clearer contractual frameworks and enforcement mechanisms are needed to address recurring breaches of deadlines and pricing agreements. Transparent auditing and dispute-resolution procedures would foster greater mutual accountability and trust between insurers and providers.

Finally, further research and monitoring are required to evaluate the impact of digitalization and administrative reforms on claims efficiency over time. Future research should expand the scope through comparative cross-country analysis across post-Soviet and lower-middle-income health systems to identify reform trajectories and contextual determinants of efficiency. Additionally, quantitative efficiency evaluations, using time-series or econometric methods, could measure the financial and administrative impact of digital reforms and governance interventions.

By strengthening these systemic components, Georgia can enhance the reliability, timeliness, and fairness of its health insurance reimbursement system.

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TALENT MANAGEMENT STRATEGIES AND THEIR PERCEIVED EFFECTIVENESS: A COMPARATIVE STUDY ON PARAMEDICAL EMPLOYEE RETENTION IN PUBLIC AND PRIVATE HOSPITALS IN OMAN'S HEALTHCARE SECTOR

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ABSTRACT

The success of the paramedical sector relies on the recruitment, retention, and growth of professionals like healthcare practitioners, nurses, laboratory technicians, and radiographers. In this context, it is obvious that the hospital's performance is dependent on managing these talents (paramedical employees), which requires further investigation. The main objective of the study is to perform a comparative analysis of talent management strategies implemented in Oman's healthcare sector, with an emphasis on paramedical employees from public and private hospitals, and assess their impact on employee retention.

The study employs a primary research design, gathering data from 200 paramedical staff in 10 public and 21 private hospitals in Muscat through quota sampling. The study found that significant differences were observed in areas like career growth and skill development, promoting diversity and inclusion, employee engagement, and meeting the needs of paramedical employees between public and private hospitals. Public hospitals also face challenges in fair evaluation and talent demonstration, whereas private hospitals face skills shortages, financial pressures, and communication issues. Also, the correlation analysis indicates that recognition of work (0.78) is highly significant for employee retention, followed by work-life balance (0.69), employee engagement (0.61), and leadership development (0.60) compared to other talent management strategies.

The study reveals that talent management practices highly influence employee retention, and the level of perceived effectiveness and their opinion on talent management is different among public and private hospitals, which also partially mediates the association between talent management strategies and employee retention.

KEYWORDS

talent management strategies, paramedical employee, employee retention, Oman healthcare sector, perceived effectiveness, public and private hospitals.

INTRODUCTION

The healthcare industry plays a critical role in society, focusing on preserving and promoting human life. However, a significant challenge lies in balancing the demands of healthcare delivery with the needs and aspirations of healthcare professionals [1]. Achieving excellence in patient care requires acknowledging that healthcare professionals are diverse individuals with unique skills and ambitions [2, 3]. Thus, talent management (TM) emerges as a strategic and systematic approach to identifying, developing, and maximising employees' potential within healthcare organisations. By aligning professional development with organisational goals, TM not only fosters employee welfare but also enhances the quality of patient care [4].

In Oman, the healthcare sector faces a significant issue in retaining paramedical staff, a challenge echoed globally across various organisations [5]. Paramedical professionals, including nurses, laboratory technicians, pharmacists, and medical assistants, are vital to the effective functioning of healthcare systems [6]. Therefore, understanding the effectiveness of TM strategies specifically designed for paramedical staff in both public and private hospitals is crucial for ensuring workforce stability and improving healthcare outcomes.

Moreover, the National Center for Statistics Information (NCSI) report shows that Omani staff outnumber foreign staff in public hospitals, while foreign staff outnumber Omani employees in private hospitals [7]. This demographic difference impacts TM strategies, as the ratio of Omani to foreign staff affects the effectiveness of these practices. This understanding is significant for evaluating TM practices, employees' level of perceived effectiveness, and their impact on employee retention in both public and private hospitals. Moreover, high employee turnover in healthcare organisations is a global issue influenced by factors such as work-related stress, burnout, long hours, and limited career advancement opportunities.

Prior research and dissertations on the healthcare system in Oman have identified areas for improvement in personnel levels, transitions, and responses to errors [8]. The existing body of literature reports that TM highly enhances employee engagement and job satisfaction [9], leadership skills, and performance [10]. Most of these studies focused primarily on hospital performance [1]. Robust TM practices in hospitals lead to higher employee retention and satisfaction [11]. Moreover, TM has often been studied with other significant factors, such as leadership, that often affect employee engagement and hospital performance [6].

Thus, implementing comprehensive TM strategies can lead to increased employee job satisfaction and reduced turnover rates in public hospitals [8]. Moreover, there exists a positive correlation between TM practices and improved patient outcomes [12]. Al-Jabri (2015) has identified a positive association between effective TM and improved financial performance in private hospitals [13]. Workforce dynamics within any organisation are greatly influenced by TM, which includes recruitment, development, and retention programs. Thus, a customised approach to TM is required due to the distinctive characteristics of the healthcare industry, including its demanding roles and specialised skill sets.

RESEARCH GAP

Previous studies have provided varying levels of information. However, there is a lack of investigation into the impact on employee retention, and no study has carried out a comparative analysis between public and private hospitals. Additionally, studies focusing on paramedical staff in the Sultanate of Oman are very limited. A notable research gap persists in the literature, with inadequate emphasis on intermediate and lower-tier paramedical personnel and their perceived effectiveness of TM as the primary subject of research. Furthermore, some studies have reported findings with only a small sample size and potential bias in participant selection.

RESEARCH OBJECTIVES

To advance TM strategies and optimise the paramedical workforce, thereby improving healthcare services in Oman, this study intends to address the following specific objectives:

- To assess the level of perceived effectiveness of TM practices among paramedical employees in both public and private hospitals within Oman's healthcare sector.
- To compare TM strategies for paramedical employees in public and private hospitals in Oman's healthcare sector.
- To evaluate the impact of TM strategies on the retention of paramedical employees in Oman's healthcare sector, considering the mediating effect of employees' level of perceived effectiveness.
- To gather insights into the opinions of paramedical employees regarding TM strategies that are particularly effective in public and private hospitals in Oman.

METHODS

RESEARCH TYPE

This study used a mixed methodology, employing a cross-sectional design to collect data directly from employees and combining quantitative and qualitative methodologies for empirical research. Here, quantitative data provides broad analysis, while qualitative data provides in-depth insights.

POPULATION AND SAMPLE

The research targeted 46,557 paramedical employees working in 10 public hospitals and 21 private hospitals in Muscat, regardless of their age, gender, etc. Eligible participants were invited to participate through an online survey using a structured questionnaire distributed via Google Forms to paramedical employees in both public and private hospitals. The survey link was disseminated using a snowball recruitment approach, whereby initial participants were asked to share the questionnaire with their colleagues. To establish a sample that fairly represents the whole population of paramedical professionals working in Oman's healthcare sector, the non-probability sampling approach of quota sampling was employed [14]. Thus, a sample of 200 paramedical staff, covering 100 from public and 100 from private hospitals, was carefully selected for a comprehensive representation of the study population. This exceeds the minimum sample size of 138 estimated participants based on a population of 47,000 paramedical employees, a 5% margin of error, and a 95% confidence interval.

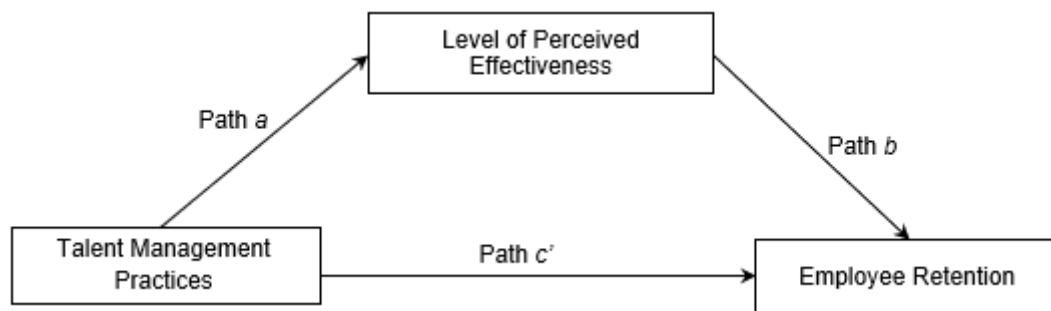
CONCEPTUAL FRAMEWORK

The proposed conceptual framework analyses the relationship between TM strategies implemented and employee retention in public and private hospitals within the healthcare sector. In this framework, TM serves as the independent variable, while the level of perceived effectiveness of TM strategies among paramedical employees acts as the mediating variable. The impact of these factors on employee retention, the dependent variable, is assessed to understand how effective TM practices contribute to retaining paramedical staff.

Furthermore, the study includes a comparative analysis of paramedical employees' experiences in public versus private hospitals, recognising that different organisational contexts may influence the effectiveness of TM strategies. This comparative analysis aims to uncover distinct patterns and outcomes related to employee retention in both public and private hospital settings.

Figure 1 illustrates the conceptual framework and provides a visual representation of the interrelationships between these variables. This visualisation helps in understanding how effective TM strategies can lead to improved employee retention by considering the mediating role of employees' level of perceived effectiveness.

FIGURE 1. PROPOSED CONCEPTUAL FRAMEWORK



RESEARCH HYPOTHESIS

The following hypotheses are developed and tested:

H1: There is a significant difference in the level of perceived effectiveness of TM practices among paramedical employees in public and private hospitals in Oman.

H2: There is a significant difference in the implementation of various TM strategies between public and private hospitals in Oman's healthcare sector.

H3: The implementation of TM strategies has a significant impact on the retention of paramedical employees in Oman's healthcare sector, with the level of perceived effectiveness serving as a mediating factor in this relationship.

H4: There is a significant difference in the opinions of paramedical employees regarding the effectiveness of TM practices between public and private hospitals in Oman.

RESEARCH INSTRUMENT

The study employed a structured questionnaire as the primary data collection tool to systematically explore and evaluate the TM processes for paramedical staff in the healthcare industry. Data were collected using a 5-point Likert scale, enabling nuanced insights into participants' perceptions and experiences.

Questionnaire Structure: The questionnaire comprises 33 questions, including 30 closed-ended questions for quantitative analysis and 3 open-ended questions for qualitative analysis. The closed-ended questions are categorised as follows: 10 on talent management practices, 10 on the employees' level of perceived effectiveness, and 10 on employee retention. Additionally, the open-ended questions focus on specific TM strategies or programs that are effective for paramedical employees, challenges faced regarding TM in the healthcare sector, and specific suggestions on TM strategies that should be emphasised or valued in hospitals. Appendix 1 presents the final survey questionnaire.

The questionnaire was developed by integrating components from relevant studies identified through a comprehensive literature review. Instruments were drawn from previous works on TM strategies by Dzimbiri and Molefi (2021) [15] and Obeidat et al. (2018) [16], employee retention by Phan et al. (2022) [10], and the perceived effectiveness of TM strategies by Yassin and Obeidat (2020) [17], Al Aina and Atan (2020) [18], and El Dahshan et al. (2018) [19] to ensure validity and reliability.

Ten TM strategies identified from existing literature are included in the analysis: talent acquisition, development and career growth, onboarding process, rewarding employees, skill development, promoting diversity and inclusion, employee engagement, employee retention, adapting strategies based on trends, and meeting the needs of paramedical employees. These strategies provide a framework for understanding effective TM practices within the context of the research model.

Expert Evaluation: Two experts extensively evaluated the survey questions to enhance their effectiveness. This process involved gathering expert feedback, conducting pilot testing with paramedical employees, and revising questions based on both expert and participant feedback. The experts made sure that the questionnaire fit with the study's main ideas and accurately measured aspects of TM practices, level of perceived effectiveness, and employee retention to produce accurate data for the study.

Ethical Considerations: The online survey targeted paramedical employees in Oman's healthcare sector, collecting data from both public and private hospitals via Google Forms. Participation was voluntary, and informed consent was obtained electronically from all participants on the first page of the survey prior to data collection. Formal approval from an institutional research ethics committee was not required for this study, as it involved anonymous survey data and did not collect any personally identifiable information, in accordance with applicable national research ethics guidelines, including the National Health and Medical Research Council (NHMRC) ethical standards. Participant anonymity and confidentiality were preserved throughout the study, and participants were informed of their right to withdraw at any stage without penalty.

This structured approach ensures that the collected data directly addresses the research model's objectives: assessing the level of perceived effectiveness of TM practices, comparing strategies in different hospital types, and evaluating the impact of TM on employee retention while considering employees' perceptions.

DATA ANALYSIS

To achieve the study objectives, various data analysis approaches - including quartiles, correlation, mediation analysis, independent t-tests, and sentiment analysis - were employed, with results presented in tables and graphs for clarity and interpretation. Specifically, the empirical analysis was conducted using SPSS, a statistical software package for data analysis. Various methods were applied to address each research objective: 1) The level of perceived effectiveness of TM practices among paramedical employees was assessed using the quartile method; 2) TM strategies in public and private hospitals were compared through an independent t-test; and 3) the impact of TM and level of perceived effectiveness on employee retention was evaluated using correlation and mediation analyses. Additionally, Orange software facilitated a comprehensive analysis of paramedical employees' perceptions of effective TM strategies through sentiment analysis.

RESULTS

RELIABILITY STATISTICS

To begin with, the analysis involves conducting a reliability test using SPSS, which assesses the internal consistency and reliability of a measurement instrument. Each study variable, including TM practices (10 items), level of perceived effectiveness (10 items), and employee retention (10 items), undergoes analysis. Table 1 presents the results of the reliability statistics. The results indicate that all variables demonstrate a high value of Cronbach's alpha and an overall reliability statistic of 0.932, suggesting strong reliability on the measurement scale.

TABLE 1. RELIABILITY TEST

Study Variables	Cronbach's Alpha	No. of Items
Talent Management Practices	0.834	10
Level of Perceived Effectiveness	0.847	10
Employee Retention	0.823	10
Overall	0.932	30

Moreover, the reliability and validity of qualitative data for the 3 open-ended questions were also assessed through expert reviews of the responses to open-ended questions. Internal consistency was evaluated by categorising the responses into themes and assessing the degree of agreement among the experts. Furthermore, it also confirmed that the responses are representative of the constructs being measured, enhancing the trustworthiness of the findings.

Further, Table 2 provides the distribution of respondents who participated in the study. Most of the respondents are full-time employees (66.5%) with middle-level job positions (54%), aged between 25-44 (67.5%), holding bachelor's degrees (70%), and possessing 5-20 years of experience (60%). They are highly involved in direct patient care (86.5%), with a majority being female (56.5%). Furthermore, the analysis reveals that 62.5% of employees report satisfaction with their jobs, while 66% are likely to recommend their workplace. These findings underscore the level of job satisfaction and validate the respondents' perspectives in the study.

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF OMAN PARAMEDICAL EMPLOYEES IN THE STUDY

Demographic Factors	Values	Frequency	Percentage
Gender	Male	87	43.5%
	Female	113	56.5%
Age	18-24 years	44	22%
	25-34 years	69	34.5%
	35-44 years	66	33%
	45-54 years	19	9.5%
	55 years or above	2	1%
Education Level	High school degree or equivalent	6	3%
	Diploma degree	24	12%
	Bachelor's degree	140	70%
	Graduate degree	19	9.5%
	Ph.D. or higher	11	5.5%
Job Title or Position	Senior Level	36	18%
	Middle level	108	54%
	Entry level	56	28%
Working Experience	Less than 5 years	54	27%
	5-10 years	62	31%
	11-20 years	58	29%
	21-30 years	23	11.5%
	More than 30 years	3	1.5%
Employment type	Full-time	133	66.5%
	Part-time	29	14.5%
	Contract	29	14.5%
	Temporary	9	4.5%
Involvement in Patient Care	Yes	173	86.5%
	No	27	13.5%
Job Satisfaction Level	Very Satisfied	56	28.0%
	Satisfied	69	34.5%
	Neutral	65	32.5%
	Dissatisfied	1	0.5%
	Very Dissatisfied	9	4.5%

QUARTILE ANALYSIS ON THE LEVEL OF PERCEIVED EFFECTIVENESS OF TM PRACTICES

To address the first objective, the responses to the 10 items measuring the level of perceived effectiveness are categorised into three levels: low, medium, and high, as detailed in Table 3. The study evaluates the level of perceived effectiveness of TM practices in Oman's healthcare sector, finding a medium level of effectiveness overall. However, there are significant variations in the level of perceived effectiveness of TM practices between public and private hospitals.

Paramedical employees in public hospitals perceive TM practices as having medium to low effectiveness, while those in private hospitals perceive them as medium to high effectiveness. These findings support the acceptance of H1.

TABLE 3. LEVEL OF PERCEIVED EFFECTIVENESS OF TM PRACTICES

Level	Level of Perceived Effectiveness in %		
	Public Hospitals	Private Hospitals	Overall
Low Level	38	14	26
Medium Level	39	47	43
High Level	23	39	31

INDEPENDENT T-TEST FOR THE COMPARISON OF TM STRATEGIES

To achieve the second objective, the study employed an independent sample t-test to compare the means of two distinct groups for ten items related to TM strategies. Table 4 presents the results of the interdependent sample t-test.

TABLE 4. RESULTS FOR INDEPENDENT T-TEST

Items	Equal Variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
									Lower	Upper
TM1	Assumed	0.014	0.907	-0.657	198	0.512	-0.070	0.107	-0.280	0.140
	Not Assumed			-0.657	197.682	0.512	-0.070	0.107	-0.280	0.140
TM2	Assumed	18.029	0.000	-1.040	198	0.300	-0.110	0.106	-0.319	0.099
	Not Assumed			-1.04	175.122	0.300	-0.110	0.106	-0.319	0.099
TM3	Assumed	2.672	0.104	-1.469	198	0.143	-0.150	0.102	-0.351	0.051
	Not Assumed			-1.469	184.023	0.144	-0.150	0.102	-0.351	0.051
TM4	Assumed	3.023	0.084	-2.935	198	0.004	-0.330	0.112	-0.552	-0.108
	Not Assumed			-2.935	188.542	0.004	-0.330	0.112	-0.552	-0.108
TM5	Assumed	11.731	0.001	-1.261	198	0.209	-0.110	0.087	-0.282	0.062
	Not Assumed			-1.261	185.715	0.209	-0.110	0.087	-0.282	0.062
TM6	Assumed	9.204	0.003	-4.103	198	0.000	-0.450	0.110	-0.666	-0.234
	Not Assumed			-4.103	181.035	0.000	-0.450	0.110	-0.666	-0.234
TM7	Assumed	4.450	0.036	-1.963	198	0.051	-0.230	0.117	-0.461	0.001
	Not Assumed			-1.963	185.739	0.051	-0.230	0.117	-0.461	0.001
TM8	Assumed	2.162	0.143	-1.917	198	0.057	-0.210	0.110	-0.426	0.006
	Not Assumed			-1.917	190.719	0.057	-0.210	0.110	-0.426	0.006
TM9	Assumed	0.127	0.722	-1.356	198	0.177	-0.130	0.096	-0.319	0.059
	Not Assumed			-1.356	197.792	0.177	-0.130	0.096	-0.319	0.059
TM10	Assumed	11.765	0.001	-3.189	198	0.002	-0.370	0.116	-0.599	-0.141
	Not Assumed			-3.189	175.117	0.002	-0.370	0.116	-0.599	-0.141

Note: TM1: Talent Acquisition; TM2: Development and Career Growth; TM3: Onboarding Process; TM4: Rewarding Employees; TM5: Skill Development; TM6: Promoting Diversity and Inclusion; TM7: Employee Engagement; TM8: Employee Retention; TM9: Adapts Strategies based on Trends; TM10: Needs of Paramedical Employees

The t-test analysis indicates no significant difference in TM strategies between public and private hospitals in areas such as talent acquisition, onboarding, employee rewards, retention, and adapting strategies, leading to the rejection of H2 for these items. However, significant differences are observed between public and private hospitals in TM strategies

related to career growth, skill development, diversity promotion, employee engagement, and meeting paramedical employee needs, thereby supporting accepting H2 for these TM strategies.

CORRELATION & MEDIATION ANALYSIS ON EMPLOYEE RETENTION

To address the third objective, the collected responses for the ten items related to employee retention with TM were analysed statistically using correlation analysis. Pearson correlation was employed to evaluate the relationship between various TM elements related to employee retention, including workforce planning (WP), employee engagement (EE), performance management (PM), career development (CD), recognition and rewards (RR), work-life balance (WLB), leadership development (LD), training and development (TD), diversity and inclusion (DI), and employee well-being (EW) as presented in Table 5.

TABLE 5. CORRELATION BETWEEN TM STRATEGIES RELATED TO EMPLOYEE RETENTION

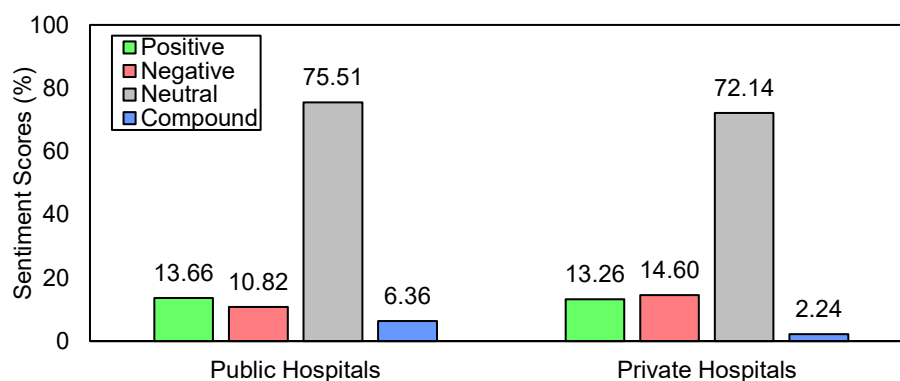
TM Variables	Details	TM Variables										
		WP	EE	PM	CD	RR	WLB	LD	TD	DI	EW	ER_AVG
WP	Correlation	1	.250**	.238**	.352**	.434**	.442**	.245**	.309**	.349**	.243**	0.577**
	Sig. (2-tailed)		<.000	<.001	<.000	<.000	<.000	<.000	<.000	<.000	<.001	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
EE	Correlation	.250**	1	.409**	.322**	.469**	.387**	.288**	.260**	.287**	.266**	0.608**
	Sig. (2-tailed)	<.000		<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
PD	Correlation	.238**	.409**	1	.292**	.481**	.381**	.316**	.248**	.197**	.260**	0.568**
	Sig. (2-tailed)	<.001	<.000		<.000	<.000	<.000	<.000	<.000	<.005	<.000	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
CD	Correlation	.352**	.322**	.292**	1	.459**	.425**	.369**	.255**	.271**	.269**	0.599**
	Sig. (2-tailed)	<.000	<.000	<.000		<.000	<.000	<.000	<.000	<.000	<.000	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
RR	Correlation	.434**	.469**	.481**	.459**	1	.486**	.494**	.503**	.513**	.443**	0.780**
	Sig. (2-tailed)	<.000	<.000	<.000	<.000		<.000	<.000	<.000	<.000	<.000	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
WLB	Correlation	.442**	.387**	.381**	.425**	.486**	1	.375**	.249**	.215**	.296**	0.688**
	Sig. (2-tailed)	<.000	<.000	<.000	<.000	<.000		<.000	<.000	<.002	<.000	<0.000
	N	200	200	200	200	200	200	200	200	200	200	200
LD	Correlation	.245**	.288**	.316**	.369**	.494**	.375**	1	.456**	.298**	.240**	.604**
	Sig. (2-tailed)	<.000	<.000	<.000	<.000	<.000	<.000		<.000	<.000	<.001	<.000
	N	200	200	200	200	200	200	200	200	200	200	200
TD	Correlation	.309**	.260**	.248**	.255**	.503**	.249**	.456**	1	.492**	.239**	.554**
	Sig. (2-tailed)	<.000	<.000	<.000	<.000	<.000	<.000	<.000		<.000	<.001	<.000
	N	200	200	200	200	200	200	200	200	200	200	200
DI	Correlation	.349**	.287**	.197**	.271**	.513**	.215**	.298**	.492**	1	.388**	.535**
	Sig. (2-tailed)	<.000	<.000	<.005	<.000	<.000	<.002	<.000	<.000		<.000	<.000
	N	200	200	200	200	200	200	200	200	200	200	200
EW	Correlation	.243**	.266**	.260**	.269**	.443**	.296**	.240**	.239**	.388**	1	.470**
	Sig. (2-tailed)	<.001	<.000	<.000	<.000	<.000	<.000	<.001	<.001	<.000		<.000
	N	200	200	200	200	200	200	200	200	200	200	200

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5 demonstrates a strong correlation between TM strategies, with recognition and rewards (0.78) being the most effective strategies for retention. Work-life balance (0.69), employee engagement (0.61), leadership development (0.60), career development (0.60), and workforce planning (0.58) exhibit moderate correlations with employee retention. The

The average scores indicated that paramedical employees in the Omani healthcare sector encounter challenges in TM practices, with private hospital employees expressing more negative sentiments compared to public hospital employees, as illustrated in Figure 3.

FIGURE 3. SENTIMENT ANALYSIS FOR CHALLENGES IN TM



Furthermore, the 108 responses from paramedical employees regarding their suggestions for TM strategies in the healthcare sector were assessed separately for public and private hospitals using *keyword analysis*. Here, the word cloud is applied to preprocessed data to visualise frequently occurring terms and their associations, identify bigrams using N-gram rag rage, and store the output for keyword analysis. Thus, the most notable suggestions identified for both types of hospitals are presented in Figures 4 and 5, respectively. The results indicate a significant difference in opinions among paramedical employees regarding the effectiveness of TM strategies between public and private hospitals in Oman, thereby supporting H4.

FIGURE 4. SUGGESTIONS FOR PUBLIC HOSPITAL EMPLOYEES



FIGURE 5. SUGGESTIONS FOR PRIVATE HOSPITAL EMPLOYEES



DISCUSSION

This research examines the importance of TM strategies for paramedical employees in Oman's healthcare sector through a comparative analysis of public and private hospitals. The study indicates that paramedical employees in Oman perceive TM practices as low to moderately effective in public hospitals and medium to high in private hospitals, highlighting the difference in the perception between employees in public and private hospitals regarding TM practices (see Table 3; H1). This finding is unique, as previous researchers have not assessed the perceptions of paramedical employees in both types of hospitals. Furthermore, the t-test results show no significant difference in TM strategies such as talent acquisition, onboarding, employee rewards, and retention between public and private hospitals (see Table 4, H2). This result aligns with Bibi's (2019) finding, which suggests that strategies like recruiting, selection, coaching, mentoring, and pay significantly enhance employee performance [20]. However, significant differences exist between public and private hospital TM strategies in areas such as career growth, skill development, diversity promotion, employee engagement, and meeting employee needs (see Table 4).

Moreover, the study reveals a strong correlation between TM strategies and employee retention, with work recognition being the most significant factor, followed by work-life balance, employee engagement, leadership development, career development, and workforce planning (see Table 5, H3). These findings are supported by Madurani and Pasaribu (2022) [21] and Bhuvaneswari and Kavitha (2024) [22]. However, Saxena and Rai (2016) [23] contradict these findings, suggesting that private hospital employees are generally more satisfied with their compensation and benefits compared to public hospital employees. Furthermore, research indicates that employee engagement in healthcare institutions significantly impacts job satisfaction and retention [24, 25], with career development and rewards affecting professional satisfaction [26] and hospital performance [1, 6]. Additionally, the study found that employees' level of perceived effectiveness partially mediated the relationship between TM practices and employee retention (see Table 6, H3).

The qualitative analysis provides various implications to the policymakers. The results indicate that positive perceptions of effective TM practices can enhance employees' attitudes towards their organisation, ultimately leading to higher satisfaction and retention rates (see Figure 2, H4). Furthermore, the study highlights specific challenges faced by public hospital employees, including issues related to fair evaluations, operating margins, talent recognition, safety, long working hours, and time management (see Figure 3, H4). Understanding these challenges is crucial for evaluating the effectiveness of TM strategies and their impact on retention, particularly in the context of public versus private healthcare settings in Oman. Conversely, private hospital employees face challenges like skill shortages, financial pressure, communication issues, high turnover rates, long work hours, and handling new technologies, which pose significant challenges in TM.

Furthermore, public hospitals should implement talent identification measures and include yearly competitions, knowledge development through seminars and conferences, skill enhancement programs for new and experienced employees, investment in performance assessment tools, and inclusive training opportunities as TM strategies for retaining talent (see Figure 4). Conversely, private hospitals should focus on improving performance reviews, providing performance-based feedback, conducting monthly training programs, recognizing and rewarding talent through incentives and promotions, and fostering teamwork (see Figure 5). Moreover, ensuring work-life balance, offering retirement benefits, conducting talent identification competitions, promoting collaborative leadership, and maintaining flexible attitudes towards paramedical employees are also crucial in the healthcare sector.

However, this study contains several limitations. The study has a narrow scope, focusing on a specific number of public and private hospitals, making it challenging to generalize the findings to all hospitals in the Sultanate of Oman. Additionally, the lack of prior research on the topic makes it difficult to obtain reliable information. The nature of the paramedical staff's work also poses challenges in obtaining responses to the questionnaire, potentially affecting the accuracy of the data and study outcomes.

CONCLUSIONS

The study analyses various elements of TM strategies in the healthcare sector, including workforce planning, employee engagement, performance management, career development, recognition and rewards, work-life balance, leadership development, training and development, diversity and inclusion, and employee well-being. It reveals that TM strategies significantly impact the retention of paramedical staff in both private and public hospitals; however, with differences in the level of perceived effectiveness among paramedical employees working in public and private hospitals. Moreover, the study finds that TM strategies have a significant effect on employee retention, partially mediated by employees' perceptions of the effectiveness of TM strategies implemented in hospitals. These findings can help hospitals to recruit and retain qualified workers, benefiting the healthcare sector.

However, future studies could expand the scope by involving a larger number of hospitals both within and outside the Sultanate of Oman, with a large number of samples. Additionally, other factors such as organisational performance and patient care, which were not covered in this study, could be included in future research. Furthermore, conducting semi-structured interviews with paramedical employees could provide more accurate results. Additionally, exploring various other mediation and moderation variables could further assess the impact of TM in the hospital sector.

DECLARATION OF CONFLICTING INTERESTS:

The Authors declare that there is no conflict of interest

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APPENDIX 1: SURVEY QUESTIONNAIRE

TM Strategies
The talent acquisition processes of the hospital effectively attract qualified professionals.
Hospitals provide opportunities for professional development and career growth.
The hospital's onboarding process, in terms of integrating new employees into the organizational culture, is satisfactory.
The hospital follows a strategy for recognizing and rewarding its employees.
The hospital encourages and supports continuous learning and skill development.
The hospital is committed to promoting diversity and inclusion in its talent management practices.
The hospital's efforts to address employee engagement and job satisfaction are satisfactory.
The hospital's retention strategies, especially in critical areas such as nursing and specialized medical roles, are adequate.
The hospital adapts talent management strategies to address changing healthcare trends, technological advancements, and evolving patient needs.
The talent management strategies in hospitals adequately address the needs of paramedical employees.
Level of Perceived Effectiveness of TM Practices
I believe talent management practices in my workplace effectively support the professional growth of paramedical employees.
I believe that talent management initiatives positively contribute to my job satisfaction as a paramedical professional.
I believe that talent management plays a crucial role in retaining skilled paramedical professionals in the healthcare sector.
I believe talent management programs in my workplace effectively identify and foster leadership potential among paramedical staff.
Opportunities for skill development and training provided through talent management are relevant to my role as a paramedical employee.
I receive adequate recognition and rewards through talent management for my contributions as a paramedical professional.
I believe talent management practices in my workplace are responsive to the changing needs of the healthcare sector.
The talent acquisition process effectively matches paramedical professionals with suitable roles in my workplace.
Talent management practices in my organization are aligned with the specific needs and challenges of paramedical roles.
Overall, I perceive the talent management practices in my workplace to be effective in supporting the success and well-being of paramedical professionals.
Employee Retention

The well-informed career advancement opportunities within the hospital influence my decision to stay.
The motivation provided by the hospital to excel in both my work and patient care is satisfactory for my continued employment at this hospital.
The great sense of fulfilment and satisfaction in the hospital motivates me to work in this organization.
The hospital's support for my professional development and growth positively influences my commitment to remain with the organization.
The hospital's acknowledgement and value placed on my contributions to patient care positively influence my decision to stay.
The hospital provides a good balance between work and personal life, which makes it a comfortable place for me to work.
The constructive feedback I receive from my supervisors' support in my professional development and influences my decision to stay.
I see opportunities to continually improve my skills in areas that are relevant and important for me to work here.
The hospital's promotion of an inclusive and optimistic work culture motivates me to work here.
I am satisfied with the organization's ability to support and retain its employees in the long run.
Open-Ended Questions
Can you describe any specific talent management strategies or programs in your workplace that you believe have been particularly effective for paramedical employees?
In your opinion, what challenges do you face in terms of talent management in the healthcare sector, and how can these challenges be addressed?
Is there any specific suggestion on talent management strategies that you believe should be emphasized or valued in hospitals?

PREPARING AUSTRALIAN HEALTHCARE MANAGERS FOR ARTIFICIAL INTELLIGENCE: CURRENT TRENDS AND STRATEGIC IMPERATIVES

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ABSTRACT

OBJECTIVE:

To analyse current trends in healthcare Artificial Intelligence (AI) implementation in Australia, identify key management challenges, and provide evidence-based recommendations for preparing healthcare managers for AI integration.

METHODS:

A comprehensive literature review was conducted using multiple databases, including PubMed and Google Scholar, with search terms such as "Australian healthcare," "artificial intelligence," "management," "implementation," and "strategy." The review focused on publications from 2020 to 2025. Data sources included peer-reviewed articles, policy documents, and implementation frameworks. The inclusion criteria specifically targeted studies that examined the implementation of AI in Australian healthcare contexts, management challenges, and preparation strategies. Data synthesis involved a thematic analysis of identified barriers, enablers, and strategic frameworks.

RESULTS:

The review identified limited clinical AI deployment in Australian hospitals, with implementation largely restricted to medical imaging. Digital maturity assessments revealed substantial infrastructure and capability gaps, particularly in predictive analytics. Barriers to adoption included socio-technical resistance, insufficient real-world evidence, fragmented data systems, unclear governance, and funding constraints. Rural services faced additional challenges related to technical support and resource limitations. Evidence from implementation frameworks and competency models highlighted the need for structured governance, capability assessments, and targeted workforce training to close the translational gap between research and practice.

CONCLUSIONS:

Australian healthcare managers require immediate action through capability assessments, governance establishment, and strategic planning to integrate AI effectively. Medium-term priorities involve pilot trials and investment in data infrastructure and competency development. Long-term success is dependent on scaled evaluation, policy advocacy, and sustained leadership commitment to evidence-based adoption of AI. Success will ultimately strike a balance between innovation and safety, efficiency and equity, and technological capability and human-centred care delivery.

KEYWORDS

artificial intelligence, healthcare management, Australia, digital transformation, implementation strategy

INTRODUCTION

The 21st century is witnessing a profound technological transformation driven by the integration of Artificial Intelligence (AI) into healthcare systems. [1] Globally, healthcare organisations are increasingly leveraging AI for clinical decision support, diagnostic assistance, and operational optimisation. In the Australian context, however, the pace and scope of clinical AI adoption remain comparatively restrained, with real-world deployments primarily limited to specific domains, such as medical imaging. Despite the global momentum, Australian healthcare systems face persistent challenges related to digital maturity, infrastructure, and preparedness for predictive analytics, which constrain broader AI implementation. [2] Addressing these obstacles requires not only technological investment but also strategic leadership and a nuanced understanding of local healthcare environments, particularly given the varying needs of urban and rural settings. [3,4] As such, healthcare managers must navigate a complex landscape characterised by evolving regulatory frameworks, socio-technical resistance, and the imperative to maintain patient safety and quality of care, all while striving to harness the innovative potential that AI offers to healthcare delivery. [4,5]

In Australia, healthcare managers hold a critical role in determining the success or failure of AI implementation initiatives. Their strategic decisions regarding resource allocation, change management, workforce development, and planning directly impact organisational readiness and the ultimate adoption outcomes. [6] The inherent complexity of AI technologies, coupled with the conservative nature of healthcare systems and ongoing regulatory uncertainties, creates a challenging environment for effective management decision-making. [4,5] Recent assessments of digital maturity within Australian healthcare reveal considerable variation across jurisdictions and persistent weaknesses, particularly in predictive analytics capabilities. [2] These findings indicate that many healthcare organisations currently lack the foundational infrastructure and essential competencies required for successful AI implementation. In parallel, the rapid acceleration of global AI research and development [7] exerts pressure on Australian healthcare managers to act decisively, while simultaneously necessitating caution to avoid premature or poorly planned implementations.

In this context, this review seeks to identify actionable strategies for Australian managers implementing AI by evaluating prevailing trends in healthcare AI adoption, analysing key challenges faced by healthcare managers, and synthesising evidence-based recommendations tailored to the distinct landscape of Australian healthcare.

METHODS

A comprehensive literature review formed the foundation of this analysis, utilising a range of reputable databases, including PubMed and Google Scholar. Specific search terms, including "Australian healthcare," "artificial intelligence," "management," "implementation," and "strategy", were used to ensure a thorough and targeted exploration of the topic. The review concentrated on publications released between 2020 and 2025, drawing from a diverse mix of peer-reviewed articles, policy documents, and implementation frameworks. The inclusion criteria were stringent, focusing exclusively on studies that addressed the implementation of AI within Australian healthcare settings, management challenges, and preparatory strategies relevant to this context. To synthesise the data, a thematic analysis was employed, allowing for the identification and organisation of recurring barriers, enablers, and strategic frameworks highlighted across the literature. This approach facilitated not only an understanding of the obstacles but also the identification of actionable pathways towards effective AI integration. By distilling insights from a wide spectrum of sources, the review provided a basis for evidence-based recommendations aimed at equipping Australian healthcare managers with the knowledge and tools necessary to navigate the complex landscape of AI adoption.

To address the qualitative nature of this review and minimise confirmation bias, explicit strategies were applied. Diverse perspectives were ensured through a systematic search that incorporated literature on risks, challenges, and reasons for delayed adoption. At the same time, publication bias was countered by critically examining both implementation failures and successes. Given the predominance of healthcare AI literature from the US, UK, and European contexts, Australian-

specific evidence and policy documents were prioritised to maintain relevance. To further reduce selection bias established frameworks, such as NASSS and SALIENT, were utilised to structure the synthesis and enhance transparency.

CURRENT TRENDS IN AUSTRALIAN HEALTHCARE AI IMPLEMENTATION

Limited Clinical AI Deployment

Australian hospitals demonstrate remarkably limited clinical AI implementation, primarily confined to established medical imaging applications. [2] A comprehensive analysis by Van der Vegt et al. (2023) revealed that most Australian hospitals remain "effectively clinical-AI free" outside of radiology departments. [2] These contrast sharply with more aggressive adoption patterns observed in comparable international healthcare systems. [7] This implementation gap not only reflects broader challenges in translating AI research into clinical practice but also highlights that a significant portion of Australian AI healthcare research remains retrospective, failing to progress to live clinical deployments. ⁽²⁾ The sparse deployment extends across numerous clinical domains where AI has demonstrated proven benefits internationally, suggesting that clinical decision support systems, predictive analytics for patient deterioration, and AI-assisted diagnostic tools are mainly absent from Australian healthcare workflows. ⁽²⁾ This conservative approach, while potentially mitigating implementation risks, may concurrently limit opportunities for enhancing patient outcomes and operational efficiency.

Digital Maturity Assessment Findings

Systematic evaluations of Australian healthcare digital maturity, utilising the Digital Health Indicator (DHI), expose concerning patterns that directly impede AI readiness. [6,8] Woods et al. (2022) reported significant jurisdictional variation in digital capabilities. [8] These digital maturity assessments underscore fundamental infrastructure gaps that limit the potential for AI implementation, as organisations with low predictive analytics maturity typically lack the necessary data pipeline sophistication, analytical capabilities, and technical infrastructure. The observed jurisdictional variation further suggests that AI readiness is not uniform across Australian healthcare systems, necessitating tailored approaches to preparation and implementation. [2]

Regulation and Governance

A thorough understanding of AI regulation in Australia is essential for the effective implementation of AI in healthcare. The Therapeutic Goods Administration (TGA) adopts a risk-based, technology-neutral approach to regulating medical devices, including digital health tools, through the Software as a Medical Device (SaMD) pathway. [9] While the framework is largely considered fit for purpose, ongoing reviews aim to clarify definitions and better accommodate the unique attributes of AI. The Australian Government has committed significant funding and undertaken a legislative review to support the safe adoption of AI, prioritising mandatory safeguards in high-risk healthcare settings. [10] Simultaneously, health practitioners retain full responsibility for care quality, maintaining the 'human in the loop' principle to mitigate automation risks. In line with regulations, clinical governance plays a crucial role in ensuring the safe and accountable use of AI and digital tools. National frameworks, such as the NSQHS Standards and the National Model Clinical Governance Framework, set rigorous requirements for governance, leadership, culture, patient safety systems, and clinical performance, all of which are regularly monitored.⁽¹¹⁾ Healthcare managers must explicitly integrate AI technologies within these standards to ensure ongoing accountability and high-quality patient care as the clinical governance frameworks continue to evolve.

Global Research Acceleration vs. Local Implementation

A Bibliometric Analysis of Global Healthcare AI Research reveals exponential growth in scholarly output, accompanied by the emergence of thematic trends, indicating rapid technological advancements. [12] D'Ascenzo et al. (2024) identified a significant acceleration in AI healthcare research publications over the past decade, demonstrating the rapidly expanding knowledge base for healthcare AI implementation. [12] However, this global research momentum starkly contrasts with the limited practical implementation observed in Australian healthcare settings. [2] This disconnect between research advancements and clinical implementation reflects broader challenges in translating healthcare technology. While Australian academic institutions and research organisations contribute substantially to global AI healthcare knowledge, the pathway from research findings to clinical practice remains underdeveloped within the Australian context.

Rural and Regional Considerations

Australian rural healthcare stakeholders have expressed specific concerns regarding AI implementation approaches that may not adequately consider local contexts and resource constraints. Kooroor et al. (2024) cautioned against "shortcuts" and "false economy" approaches to AI implementation that fail to account for the unique challenges of rural healthcare delivery. [3] Rural healthcare managers face additional hurdles, including limited technical support infrastructure, smaller patient populations available for AI model validation, and constrained financial resources for technology investments. These factors necessitate careful consideration of AI implementation priorities and approaches that may differ significantly from those in urban healthcare settings. [3,13]

MANAGEMENT CHALLENGES AND IMPLEMENTATION BARRIERS

Healthcare managers consistently encounter several complex socio-technical and infrastructural barriers to AI implementation:

- **Socio-Technical Resistance:** Resistance to AI implementation often arises from clinical staff and other stakeholders who express concerns about workflow disruptions, professional autonomy, and the reliability of the technology. (14) Brommeyer et al. (2024) identified resistance as a dominant theme in qualitative studies on digital health transformation in Australia, manifesting as reluctance to change established workflows, scepticism about AI model accuracy, and worries about automation's impact on clinical decision-making. [14] Addressing this resistance requires sophisticated change management approaches that tackle both rational concerns about AI performance and emotional responses to technological change. [13]
- **Trust and Evidence Gaps:** A significant barrier to trust for both clinicians and managers is the lack of robust real-world evidence for AI performance within Australian healthcare contexts. [2,15,16] Most AI healthcare research remains retrospective, with limited prospective evaluation and virtually no infrastructure for "silent trials" to test AI systems in live clinical environments before full implementation. [2] This evidence gap complicates informed decision-making regarding AI adoption and raises ongoing concerns about model performance across diverse patient populations. Trust issues are further compounded by the "black box" nature of many AI algorithms, which offer limited transparency regarding their decision-making processes. [17] Healthcare managers must weigh the potential benefits of AI against the risks associated with deploying systems lacking precise explanatory mechanisms and comprehensive local validation. [15,16]
- **Resource and Infrastructure Constraints:** Australian healthcare organisations face considerable resource constraints that impede their capacity for AI implementation. [14] These include inadequate funding for technology investments, insufficient technical expertise within healthcare teams, and limited access to specialised AI implementation support. The absence of a standard prospective evaluation infrastructure particularly restricts organisations' ability to conduct appropriate testing before clinical deployment. [2] Infrastructure challenges extend beyond financial resources to encompass data management capabilities, interoperability standards, and technical support systems. [14] Many organisations lack the sophisticated data pipelines necessary for AI implementation, with inconsistent electronic medical record integration and siloed information systems reducing the feasibility of comprehensive AI deployment. [2]
- **Governance and Regulatory Uncertainty:** Healthcare managers must navigate unclear regulatory approval pathways, liability frameworks, and reimbursement models, which create additional barriers to implementing AI. [4,5,13] The regulatory landscape for healthcare AI is continually evolving, providing limited guidance for managers seeking to understand compliance requirements and risk management obligations. This uncertainty complicates the development of comprehensive implementation strategies and can lead to conservative approaches that hinder the adoption of beneficial AI. Governance challenges also involve establishing appropriate oversight mechanisms for AI systems, defining accountability structures for AI-assisted clinical decisions, and developing policies for ongoing monitoring and quality assurance. (13) Managers require clear frameworks to address these governance issues while maintaining organisational flexibility for technological adaptation. [5,16]
- **Data Quality and Interoperability Issues:** Poor data quality and limited interoperability between healthcare information systems pose significant barriers to the successful implementation of AI. [14] Many Australian healthcare organisations struggle with inconsistent data collection practices, incomplete patient records, and fragmented information systems, which collectively prevent the comprehensive data integration essential for effective AI

deployment. Addressing these data challenges necessitates substantial investment in data management infrastructure, standardisation processes, and quality improvement initiatives before AI implementation can succeed. (5,16) Healthcare managers must prioritise data governance and interoperability improvements as foundational elements of AI readiness, acknowledging that these investments, while not always providing immediate visible returns, are crucial for long-term success. [5,16]

STRATEGIC PREPARATION FRAMEWORKS AND MANAGEMENT COMPETENCIES

Implementation Framework Comparison

Healthcare managers can significantly benefit from structured implementation frameworks that offer systematic approaches to AI adoption. Three prominent frameworks offer complementary strengths: SALIENT (end-to-end AI implementation stages) [19], NASSS (Non-Adoption, Abandonment, Scale-up, Spread, Sustainability) [13], and targeted competency development approaches (14,20). The SALIENT framework provides a practical roadmap for staged AI evaluation, emphasising the importance of silent trials and standardised reporting throughout the implementation process. [19] It guides managers through problem definition, retrospective analysis, prospective testing, pilot implementation, and complete rollout phases, with clear decision points and evaluation criteria at each stage. The NASSS framework offers a socio-technical lens for analysing implementation challenges and opportunities. [13] This approach helps managers understand the complex interactions between technology characteristics, organisational contexts, and broader system factors that influence the success of AI adoption. NASSS particularly stresses the importance of considering sustainability and scalability from the initial planning stages.

Management Competency Development

Successful AI implementation initiatives necessitate that healthcare managers possess specific digital and AI-related competencies.[14,15] Brommeyer et al. (2024) developed a conceptual framework for health service managers' digital competencies, highlighting the importance of technical understanding, change management skills, and strategic planning capabilities.[14] These competencies extend beyond basic digital literacy to include a sense of AI technologies, data analytics, and the ability to evaluate AI system performance and risks. Competency development must be tailored to specific management roles and responsibilities, with senior executives requiring strategic oversight capabilities, while operational managers need detailed implementation skills. [20] Training programs should integrate theoretical knowledge with practical application opportunities, such as case studies, simulation exercises, and mentoring relationships with experienced leaders in AI implementation. [14,20]

Organisational Readiness Assessment

Successful AI implementation hinges on a comprehensive organisational readiness assessment that examines technical infrastructure, workforce capabilities, governance structures, and cultural factors. [8,15,16] The Digital Health Indicator offers a structured framework for systematic capability assessment, exploring areas such as governance, workforce, interoperability, and analytics maturity.[14] Healthcare managers should conduct regular readiness assessments to pinpoint specific gaps and prioritise improvement initiatives.[5] These assessments must consider not only technical capabilities but also organisational culture, change management capacity, and stakeholder readiness for AI adoption.

Stakeholder Engagement Strategies

Effective AI implementation demands sophisticated stakeholder engagement strategies that address the concerns and interests of diverse groups, including clinicians, patients, administrators, and external partners. [8,5,16] Healthcare managers must develop communication approaches that foster trust, provide transparent information about AI capabilities and limitations, and create opportunities for meaningful participation in the implementation planning process.[8,16] Stakeholder engagement should commence early in the planning process and continue throughout the implementation and evaluation phases.[6,5] Clinical champions play a crucial role in promoting peer support and addressing professional concerns about AI adoption. Furthermore, patient and consumer representatives offer essential perspectives on the acceptability and potential impacts of AI implementation on care experiences.

DISCUSSION

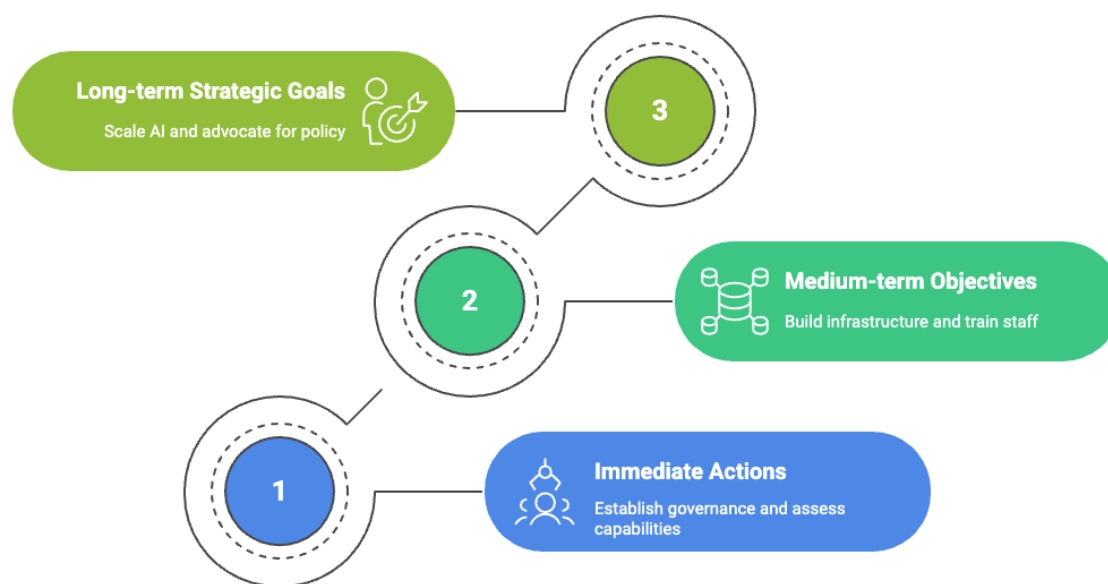
Implementing artificial intelligence in Australian healthcare settings requires a deliberate and methodical approach that considers not only the significant promise of AI technologies but also the numerous practical limitations encountered in real-world scenarios. [5,15,16] Unlike some of its international counterparts, Australia faces distinctive challenges, particularly in infrastructure development and the strategic planning required for large-scale digital innovation.[2] These factors contribute to a comparatively slower pace of AI adoption. Healthcare organisations should carefully assess risks and ensure clear value before implementing new initiatives, despite the potential for better outcomes and efficiency. An ambiguous value proposition or reliance on immature technology can result in failed implementations, ultimately threatening organisational trust and hindering future efforts to integrate AI solutions effectively. [15,16]

RECOMMENDATIONS FOR PRACTICE

To address the identified challenges and facilitate successful AI integration, Australian healthcare managers should pursue a staged approach with clear priorities:

- **Immediate Actions (0-6 months):**
 - **Comprehensive Capability Assessment:** Utilise established frameworks like the Digital Health Indicator [8] to identify specific organisational strengths and gaps across governance structures, workforce capabilities, technical infrastructure, and analytics maturity. This provides a clear baseline for improvement planning.
 - **Define AI Implementation Priorities:** Employ structured approaches to identify high-value, low-risk use cases with clear success metrics. ^(2,18) This prioritisation process should actively involve clinical stakeholders, consider patient safety implications, and align with broader organisational strategic objectives.
 - **Establish Governance Structures:** Create multidisciplinary AI governance groups comprising clinical champions, information technology specialists, legal advisors, and consumer representatives. ⁽¹⁸⁾ These groups are responsible for establishing clear policies and procedures for evaluating, implementing, and overseeing AI.
- **Medium-term Objectives (6-18 months):**
 - **Partnerships for Evaluation:** Secure partnerships and resources to conduct prospective and silent evaluations prior to clinical rollout, using standardised reporting guidance to ensure comprehensive assessment. [15,16]
 - **Investment in Data Pipeline Infrastructure:** Prioritise improvements in interoperability and data quality processes. [2,6] These investments will support robust AI performance while delivering immediate benefits for current operations.
 - **Targeted Training Programs:** Implement management and staff training programs based on established competency frameworks and organisational needs. [14,20] These programs should combine theoretical knowledge with practical application opportunities and provide ongoing support for skill development and maintenance.
- **Long-term Strategic Goals (18+ months):**
 - **Systematic Scaling and Evaluation:** Move from small-scale pilot implementations to comprehensive deployment only after establishing clear evidence of safety, effectiveness, and equity impacts, supported by continuous evaluation and evidence generation. [2,7]
 - **Policy Advocacy:** Healthcare managers should leverage local evaluation results to advocate for jurisdictional investment in shared evaluation infrastructure and regulatory clarity. [6,15] This advocacy should highlight the collective benefits of coordinated AI implementation support and the importance of evidence-based policy development.
 - **Sustained Leadership Commitment and Culture Development:** Embed AI considerations into strategic planning processes, performance management systems, and organisational development initiatives to ensure sustained progress and adaptation.[18]

FIGURE. 1. IMPLEMENTATION AND INTEGRATION PATH FOR HEALTHCARE AI



Both clinical and operational risks must be rigorously addressed when considering the adoption of AI. [5,16] From a clinical standpoint, key concerns include the potential for algorithmic bias, which can inadvertently exacerbate health disparities by reflecting and amplifying existing inequities within datasets.[18] There is also considerable uncertainty regarding accountability in cases of malpractice or adverse outcomes, particularly when decision-making is partly or wholly delegated to opaque AI systems.[18] Over time, clinicians may become over-reliant on automated solutions, risking a decline in their own skills and professional judgment. Operationally, the introduction of AI can disrupt established workflows, increase cognitive demands on staff, and require significant upfront investment without guaranteed financial returns. Moreover, the automation of routine tasks and alterations to workforce roles may result in diminished practical expertise and reduced empathy within patient care services. [15,18] These multifaceted challenges underscore the importance of aligning technology implementation with robust governance and ongoing support for the workforce.[18]

Given the complexity of AI integration, healthcare organisations need to avoid premature deployment, particularly when the technology is still evolving or the anticipated benefits remain uncertain. Smaller providers and those with limited resources may achieve greater gains by first focusing on foundational improvements, rather than rushing into sophisticated AI projects. The findings presented here are subject to several significant limitations. The review employed a narrative approach, which is less rigorous than systematic methods and reflects the views of a single reviewer, thereby potentially introducing bias. Crucially, the evidence base for AI in Australian healthcare remains sparse [2], forcing reliance on international frameworks that may not fully capture the unique dynamics of local systems. The wider AI literature may also reflect publication bias, with positive results more likely to be reported.[21] Rapid technological advancements mean that recent developments may have been overlooked, and the author's direct involvement in healthcare AI research, although mitigated by efforts to remain balanced, could still influence the interpretation of the findings.

The success of healthcare managers in AI implementation will ultimately hinge on their ability to strike a delicate balance between innovation and safety, efficiency and equity, and technological capability with human-centred care delivery. [18] Organisations that proactively invest in systematic preparation and strategic implementation, while remaining transparent about risks and limitations, will be optimally positioned to realise the potential benefits of AI technologies.[2,15,18] Navigating this complex environment is less like launching a spaceship (a single, perfect shot) and more like setting a highly sensitive nautical course: managers must constantly check regulatory currents, adjust the sail for

operational headwinds, and use all available navigation tools (governance frameworks) to ensure the vessel (patient care) remains safe and on course toward the distant, promising horizon of innovation.

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PREPAREDNESS OF HEALTH AND SOCIAL CARE WORKFORCES IN USING DIGITAL TECHNOLOGIES IN RESIDENTIAL AGED CARE: A SCOPING REVIEW

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ABSTRACT

OBJECTIVES

Residential aged care (RAC) facilities globally lag in implementing digital health systems due to factors like non-profit status, workforce challenges, and limited solutions. Successful adoption of digital health solutions necessitates workforce support and ongoing training. This scoping review examines the current state of research regarding workforce readiness for digital technology adoption in RAC.

METHODS

The review employed scoping methodology following PRISMA-ScR guidelines. Databases including Web of Science, Medline Ovid, Ovid Emcare, JBI EBP Database, CINAHL, and reference lists were searched using relevant keywords and MeSH terms.

RESULTS

Out of 458 screened articles, 21 were included for analysis. Three key themes emerged as influences on RAC workforce preparedness and technology adoption: Capability, Digital Governance, and Collaboration.

CONCLUSION

Effective RAC workforce preparation in technology adoption requires a holistic approach, involving strong leadership, adequate resources, and continuous support. The literature on workforce development in RAC with digital technologies remains limited, necessitating further research.

KEYWORDS

Digital, information, technology (IT), residential aged care (RAC), workforce

INTRODUCTION

The proportion of older people is increasing globally, and it is estimated the number of people aged 60 years and older will grow from 1 in 8 people in 2017 to 1 in 6 by 2030 and 1 in 5 by 2050 [1]. In Australia, the number of people aged 65 years and over is projected to increase from 17% in 2022 to between 25% and 27% in 2071 [1]. Population ageing will increase the proportion of people requiring aged care in countries at all levels of development [2].

Aged care is one of the largest service industries in Australia, providing a range of programs and services [3]. There are many challenges facing the aged care sector in Australia such as improving access to health services, safety and quality, and continuity of care [4]. Digital health can play a significant role, however, aged care, globally, has not implemented digital health systems as quickly as other sectors for reasons, including their not-for-profit status, workforce and solution availability [3]. Australia's Royal Commission into Aged Care Safety and Quality in 2021 revealed only 14% of Residential Aged Care (RAC) and home care providers were registered for My Health Record, Australia's national personally controlled electronic health record [3]. The Royal Commission examined the quality of aged care services in Australia to determine if services were meeting the needs of communities [3]. Areas for improvement were strengthening safety and quality of care delivery through adoption of digital technology including My Health Record (recommendation 68) [3]. In 2025, twenty two percent of RAC providers are registered to use My Health Record however only four percent are using the system [5]. Aged care is complex, with difficulties attracting, retaining, and developing a sustainable workforce. Low wages, poor employment conditions, lack of funding and investment in staff and training are known barriers [3]. RAC provide long-term care to older people, hereafter known as residents [6]. A requirement of introducing digital health solutions is support and ongoing training for the workforce [7]. This study will adopt the approach of the World Health Organization (WHO) [8] where digital technology is used to support the needs of health systems and achieve health sector objectives and includes clients, healthcare providers, managers and data services.

Previous studies, focusing on health and social care workforces and use of information technology (IT) have concentrated on specific countries [9] or general issues with adoption of technology in aged care [10]. A recent scoping review focused on workforce development in integrated care with no emphasis on specific health sectors [11]. Insufficient evidence of how health and social care workforces have been prepared and trained to work with digital technologies in RAC settings was identified. To address this gap, the scoping review aimed to

- evaluate literature on workforce development, including its characteristics, models, barriers, challenges, opportunities and recommendations
- identify factors that can be applied in RAC to prepare for the implementation of digital technology.

STUDY OBJECTIVES

The study systematically collected and synthesised information to

- ascertain the current state of research on organisational preparedness for adoption of digital technologies in RAC
- understand factors that can be applied in RAC to prepare for implementation.

METHODS

Scoping reviews, in contrast to systematic reviews that address specific inquiries, generally encompass broader research questions. They serve the purpose of identifying knowledge gaps, establishing research focal points, and discussing implications for decision-making. Given the extensive nature of the subject matter: workforce utilisation of digital technologies within RAC, it was determined a scoping review was the most appropriate methodology. The review was conducted in accordance with the scoping review framework developed by Arksey and O'Malley. This framework comprises six stages 1) Identifying a research question, 2) Identifying relevant studies, 3) Study selection, 4) Charting the data, 5) Collating, summarising, and reporting the results, 6) Conducting an optional consultation exercise. Recommendations developed by Levac et al. [14] were incorporated into the review process. Reporting was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist, ensuring methodological transparency and compliance. This review was registered in the Open Science Framework (osf.io/bck3n).

STAGE 1: IDENTIFYING RESEARCH QUESTION

The research team discussed and agreed on research questions, target audience and intended outcomes appropriate to achieve the scoping review objectives.

The research questions

RQ1 What is known from existing global literature about health workforce development in digital technologies in RAC?

RQ2 How has the Australian health and social care workforce been prepared to work with digital technologies in RAC?

The study team applied Levac et al. [14] recommendations and articulated the scope of the inquiry to include concepts, target audience and outcomes, and this guided the search strategy.

The scoping review focused on two main concepts: (1) digital technology (2) health workforce development. The target setting was RAC, and its workforce.

Intended outcomes

- Complete a scoping review of relevant literature
- Offer recommendations for preparation, and training of RAC workforces to work with digital technologies, that can be applied globally and in Australia.

STAGE 2: IDENTIFYING RELEVANT STUDIES

An initial search was performed to identify keywords and MeSH terms. A list of terms was iteratively developed, and two databases searched. Titles and abstracts of relevant articles and MESH terms were used to develop a full search strategy in consultation with a research librarian. The full search strategy was adapted for each database. Databases searched were JBI, CINAHL, Web of Science, Ovid Emcare, and Medline. Further scanning of reference lists of articles for relevant studies and hand-searching of key relevant journals was undertaken. A search of grey literature from Sax Institute Evidence Checks, Grattan Institute, Australian Institute of Digital Health (AIDH), and peak bodies for aged care were undertaken. Table 1 provides eligibility criteria used to select articles. A sample of the full search strategy is provided (Supplementary file Appendix 1.

TABLE 1 INCLUSION AND EXCLUSION CRITERIA

Area	Inclusion	Exclusion criteria
Language	• English language	• Non- English language articles
Study designs	• All study designs	
Study type	• Peer-reviewed articles	• Abstract only • Theses • Non-peer reviewed professional journal articles • Newsletter, newspaper reports • Conference abstracts • Conference posters • Health insurance reports • Letters to the editor • Study protocols
Year of Publication	• In the period (2012 - 2022) • Repeated searches to identify papers 2023 – Oct 2025	• Articles published before 2012 (publication date < 2012)
Country	• All countries	
Concept	• Articles describe an educational model or framework and key elements or competencies in health workforce training, and education related to digital technologies in RAC	• Articles with no reference to RAC • Articles with no mention of digital technologies in RAC • Studies conducted in acute tertiary care organisations

STAGE 3: STUDY SELECTION

All studies that met inclusion criteria were imported into Endnote™ software to enable tracking and storage. Total number of studies from five databases were recorded. Studies were transferred to Covidence™ software for removal of duplicates and screening. Five reviewers ('Author 1', 'Author 2', 'Author 3', 'Author 4', 'Author 5') screened titles and abstracts, and full text articles. Any discrepancies were discussed, and consensus obtained. Reasons for excluding articles at full-text screening stage were reported. The included studies were not assessed for quality or risk of bias, as this is not a primary requirement for scoping reviews. As Peters et al. [15] explain, the main objective of a scoping review is to map the breadth and nature of available evidence, and critical appraisal is considered optional depending on the review's purpose.

STAGE 4: CHARTING THE DATA

From included studies, data was extracted using Covidence™. Informed by the research questions, items for extraction were discussed and agreed by the research team. Data items included authors, year of publication, aim, study design, target population, country where the study was conducted, type of IT used, challenges and facilitators. Disagreement between reviewers were resolved through consensus.

STAGE 5: COLLATING, SUMMARISING AND REPORTING THE RESULT

Quantitative data was collated and presented using descriptive statistics. Qualitative data were analysed, and themes identified and interpreted.

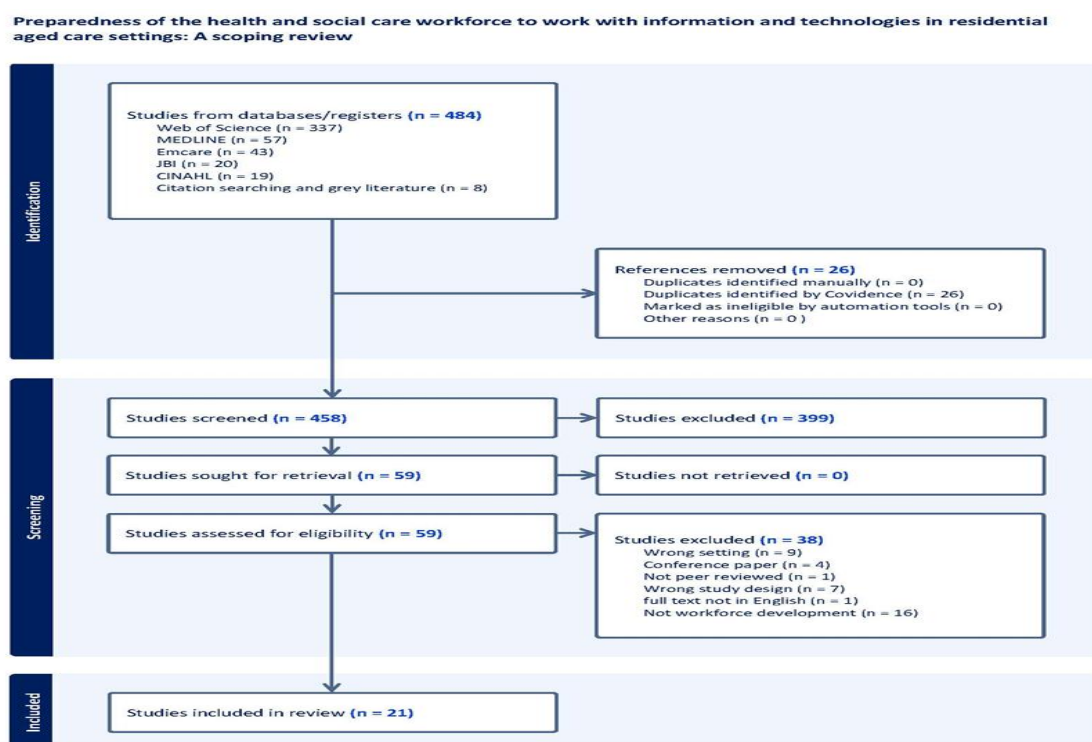
STAGE 6: CONSULTATION EXERCISE (OPTIONAL STEP)

Stage 6 was not relevant to the review objectives and research questions.

RESULTS

Searches of five databases identified 476 items for review. Six (6) additional sources from grey literature and two (2) snowball papers were imported in COVIDENCE™ for review, totally 484. After screening and removal of duplicates, 21 articles remained in the review. Search results by database are reported (Figure 1) in line with PRISMA-ScR [13]. Results are reported in three sections 1. Characteristics of included studies, 2. Uses of technology in RAC from included studies, 3. Themes identified relevant to RAC workforce development in digital technology.

FIGURE 1 SYSTEMATIC REVIEWS AND META-ANALYSES EXTENSION FOR SCOPING REVIEW (PRISMA- SCR) FLOW



CHARACTERISTICS OF STUDIES

Years of publication ranged from 2012 – 2025. Types of studies represented were cross-sectional (n=5/21, 24%), qualitative, (n = 5/21, 24%) and quantitative studies, (n = 3/21, 14%), systematic review (n = 3/21, 14%), case-series/case study (n = 2/21, 10%), and other (n = 3/21, 14%). The majority of the studies were from Australia (n = 10/21, 48%), with remaining from the United States of America (n = 2/21, 10%), United Kingdom (n = 2/21, 10%), Canada (n = 2/21, 10%) Norway (n = 2/21, 10%), Finland (n = 1/21, 5%), Germany (n=1/21, 5%) and Singapore (n=1/21, 5%). Full details on authors, aim, and study data collection methods can be found in supplementary file Appendix 2.

USES OF TECHNOLOGY IN RAC

The review identified a variety of technologies used in residential aged care settings, including iPads, digital games, telehealth platforms, sensors, and other assistive devices. Technology was most commonly used for record keeping (n=5) telehealth (n=3) and monitoring (n=4). Less frequently reported uses included in-service training and resident management. A number of studies did not specify the purpose of technology use or spoke broadly to a variety of technologies and/or the issues of technology application. Reporting on the staff using these technologies varied, with some studies referring broadly to “healthcare workers” and others including multiple staff groups without disaggregating findings by cadre.

THEMES IDENTIFIED FROM THE LITERATURE

Themes identified from the literature across all studies were Capability, Digital Governance, and Collaboration. Capability is described as encompassing knowledge, skills and attitudes required for individuals and organisations to thrive in a digital society [16]. Digital capability involves equipping individuals with necessary knowledge and skills to live, learn, and work in this digital environment [16]. Digital Governance refers to the framework outlining responsibilities, decision-making power, and change management authority for an organisation's digital presence [17]. Collaboration considers cooperation between professionals, residents, and carers as critical to successful delivery of care services [18]. The three themes and sub-themes were derived from the literature. Barriers, opportunities and recommendations were also extracted from each paper.

Tables 2, 3 and 4 summarise each theme and sub-theme, for workforce development and are reported under the themes of capability, digital governance and collaboration.

TABLE 2 THEMES AND SUB THEMES ALIGNED WITH CAPABILITY

Theme	Barriers	Opportunities	Recommendations
Subthemes			
Capability	Computer literacy and technology fear [19-22] Limited English [23] Knowledge barriers [19-21, 24, 25] Difficulty in learning new systems [19-22, 24] Lack of training and resources [24]. Time constraints [26] Potential threats to resident safety [24]. Resistance to change [24].	Competence building [19-21, 27, 30] Supervision Access to training [19-21, 27, 29] Fit for purpose training [19-21, 25, 27] Empowerment of leaders and managers [25, 33]	Digital literacy [20, 27, 29, 30] Cyber awareness and data sensitivity for workforce and consumers [20] Ongoing capability building [31] Technology advocates/ambassadors/champions [19-22, 24, 26, 32-34]

Theme	Barriers	Opportunities	Recommendations
	Lack of digital literacy assessment during recruitment [19-21, 27-29]		
	Perceived negative impact on staff [19-21, 27]		
	Complexity of vendor instructions [28]		

TABLE 3 THEMES AND SUB THEMES ALIGNED WITH DIGITAL GOVERNANCE

Theme	Barriers	Opportunities	Recommendations
Subthemes			
Digital governance	IT infrastructure instability [23] Investment Time for staff training [19-21, 27, 32] Resource concerns [23, 30] Duplication of work [35] Poor technology maintenance [35]	Interoperability [36] Organisational champions [19-21, 24, 26, 32-34]	Strengthen IT infrastructure [23] Allocate sufficient investment Time for staff training [19-21, 27, 32] Address resource concerns [23, 29] Minimise duplication of work [35] Improve technology maintenance [37]

TABLE 4 THEMES AND SUB THEMES ALIGNED WITH COLLABORATION

Theme	Barriers	Opportunities	Recommendations
Subthemes			
Collaboration	IT support services [24] Leadership support [25, 26, 38]. User engagement [33] Role and involvement of vendors [19-21, 26, 30]	Co-creation with consumers [26, 39] Vendor support and partnership [19-21, 26] User engagement [33]	Co-creation of knowledge with consumers [26, 39] Co-creation with workforce [26, 30, 39]

CAPABILITY

Barriers

Administrators reported challenges in technology adoption among staff, including issues related to computer literacy, fear, and uncertainty [19-21, 29, 30]. Language barriers were also identified hindering effective technology utilisation, impacting communication and training [23]. Level of knowledge and familiarity with technology plays a role in successful adoption [19-22, 24, 25]. Inadequate training and limited access to resources can result in frustration and resistance among employees [24]. Learning complex systems such as wireless nurse call systems (WNCS) can pose challenges, leading to reluctance among some employees to embrace new technologies [19-21, 24]. Implementing new systems and technologies requires dedicated time for training, and vendor instructions on system use were identified as challenges

[24]. Complexity of vendor instructions exacerbates difficulties faced by staff during implementation [24, 32]. There are risks to healthcare user safety when new workflows and systems are introduced, particularly if staff members are not familiar with the technology [24]. Resistance to technology adoption can stem from fear, stress, and negative perceptions of the impact on work processes [19-21, 27]. Organisations often overlook assessment of digital literacy during recruitment, resulting in staff with inadequate technology skills [19-21, 27, 28]. Introduction of computerised care systems can lead to stress among staff, particularly those overwhelmed by system use and decision-making challenges [28].

Opportunities

To promote RAC workforce capability, various strategies and practices can be implemented. Skill acquisition and problem-solving capabilities can be enhanced through the availability of support and interaction with vendors. Access to ongoing training, supervision, practical experience, and collective reflections are proven methods for fostering a positive implementation culture and empowering staff to use technology effectively in RAC [26, 35]. RAC can focus on preparation of the workforce and digital skills training to facilitate adoption of new technology [19-21, 23-25, 27, 29, 30, 32-34, 37]. Preparation and oversight of ongoing training programs in workplaces are essential to ensure workforces are fit for purpose [19-21, 27]. Smart technology, for example, requires support to equip users to use devices effectively [19-21]. Terminologies such as Technology Advocates, Ambassadors and Champions are referred to in the literature [19-21, 24, 26, 32-34]. While papers used terminologies in nuanced ways, these roles provided training and support at site level and proved successful in building technology capabilities among RAC workforces [23]. These roles worked with all employees to promote benefits of new technologies and supported workers to incorporate technologies into practice [33, 34, 37]. Technology Advocates, Ambassadors and Champion roles are critical to reinforce new practice and the use of tools to deliver improved RAC [19-21, 24, 26]. Leaders play a role in workforce development through the provision of resources, supportive organisational cultures, acknowledgment of staff input and innovation, and evaluation of outcomes [24, 25, 28, 39]. Empowering leaders advances staff confidence and capability with technology adoption [24, 28].

To enhance workforce development, stakeholder involvement is essential. Including RAC staff, system users, residents, carers and care managers in training sessions outlining the benefits of technology can upskill care staff and promote person-centred care approaches [19-21, 23, 26, 28, 33, 34, 36, 37]. Vocational and undergraduate education needs to address gaps in digital health capabilities and provide embedded opportunities for students to engage with systems such as electronic health records during their education [31].

DIGITAL GOVERNANCE

Barriers

Barriers are reinforced by absence of digital and clinical governance standards and training policies, creating obstacles to safe and appropriate use of telehealth and hindering adoption of technology [20]. Governance-related barriers are exacerbated by variations in capability, workforce shortages, limited government funding, and insufficient demand from both providers and consumers [20, 30]. Persistent and multifaceted barriers to the effective integration of technology in healthcare services is a combination of unstable information technology (IT) infrastructure and inadequate support from IT services, impeding collaborative efforts to co-create value [23, 26]. This instability has been shown to have detrimental effects on implementation and utilisation of technology, delaying potential benefits in productivity and the quality of care [23]. Problems are exacerbated by insufficient investments in technology infrastructure, support personnel, and training opportunities for staff. This manifests as insufficient time allocations for training, lack of tailored training sessions to meet staff needs, and inconsistency in training related to system updates [23]. Issues with technology maintenance and inadequate management practices contribute to instability [35]. In RAC, recurring issues include a lack of processes for IT implementation, limited technology support and infrastructure, and underinvestment in staff training [23, 29]. Further, paper and electronic data capture often coexist, and difficulty accessing and integrating data from various sources, hampers efficient utilisation of technology and data and duplication of work [35]. Attitudes and beliefs of staff members, coupled with cultural resistance to IT adoption, as well as the complexity of decision-making involving multiple stakeholders in RAC settings, present additional barriers to successful implementation of technology [37].

Opportunities

Interoperability frameworks and inclusion in digital governance structures are critical. Effective governance practices support seamless exchange of information and data among different systems and care providers [19-21, 36]. Confirming systems are interoperable, RAC can access comprehensive and up-to-date resident information, leading to informed decision-making and enhanced care coordination [36]. Governance plays a role in fostering a culture of innovation and technology adoption within RAC. Strong leadership and organisational support are essential for workforce development initiatives centred around technology. Leaders must demonstrate commitment to digital transformation and invest in training programs to upskill the workforce to use technology effectively [19-21, 23, 24, 38]. RAC digital governance strategies should recognise Technology Advocates, Ambassadors and Champions; these roles are responsible for promoting health information systems during implementation and providing ongoing support [19-21, 24, 26, 32-34]. Acting as change agents they drive workforce development to align with RAC goals for technology adoption [35].

Digital governance within RAC settings extends beyond facility boundaries, necessitating collaboration with external stakeholders such as vendors and healthcare providers to ensure interoperability. Benefits of shared data standards and protocols offer exchange of information for residents and staff [33]. Digital governance strategies should prioritise design and implementation of training programs, focusing on enhancing digital literacy and technological preparedness of the workforce [19-21, 23, 27]. Equipping staff with essential skills to proficiently navigate systems enhances their capacity for utilising technology in care delivery [20]. Digital governance approaches should incorporate mechanisms for ongoing evaluation and improvement of interoperability initiatives [19-21, 36]. Fostering cultures of continuous improvement, workforces can become adept at leveraging technology and adaptable to evolving requirements [28]. Effective digital governance in RAC includes the use of industry agreed standards for IT and information exchange to address privacy and security concerns [19-21]. Staff training should emphasise the importance of safeguarding resident information and complying with data protection regulations.

Digital governance practices establish trust in technology and reduce concerns about data breaches [33]. Digital governance includes development and implementation of policies that guide IT use and practice and should align with agreed standards, ensuring compliance and consistency to support data exchange. Clear policies provide frameworks for workforces to operate within, supporting effective and secure technology usage [36].

COLLABORATION

Barriers

Effective collaboration is crucial for successful implementation of technology in RAC. Barriers relating to collaboration hinder adoption of systems and technology. Dugstad, Eide, Nilsen and Eide [26] suggest a combination of IT infrastructure instability, lack of support to address weaknesses impacts implementation and hamper's ability to co-create value between technology providers and healthcare stakeholders. Collaboration plays a significant role in engaging frontline staff with new technology. Collaborative efforts are essential for creating and implementing processes for health IT adoption. Absence of collaborative planning and support for health IT implementation in RAC limits the potential to realise gains in productivity and quality of care [23, 25]. Collaboration to build capability across rostered hours of work and frontline roles, involving stakeholders, and maintaining leadership involvement are vital [26, 38]. Empowering technology champions at the frontline and involving them in implementation fosters a collaborative culture, leading to better user engagement and more effective technology utilisation [30, 33]. Partnership with technology vendors can overcome barriers related to the complexity of implementation [19-21, 26, 30]. Effective training, provision of equipment and resources, and clear instructions from vendors are components for successful collaboration in technology adoption [26].

Opportunities

Collaboration is key to successful adoption of technology in RAC, it involves multiple stakeholders working together to co-create value and improve practices. Implementing novel digital monitoring technology requires a comprehensive approach, considering needs of care providers, residents, carers and relatives [26, 33].

Collaboration is required to integrate IT capability directly into provision of care and co-creation with residents, carers and relatives. This shift towards an integrated and sustainable healthcare ecosystem will facilitate digital transformation [26,

30]. Ongoing support and training are essential and co-designing workflows and operational processes with workforces fosters ownership and engagement in technology implementation. Additionally, integrating technology-specific changes as part of a wider organisational improvement program enhances effectiveness and sustainability of adoption [20]. Financial investment in IT, implementation readiness, and learning capabilities of RAC workforces are necessary for successful technology adoption. Deliberate design, practices, and work arrangements that promote learning-oriented cultures can enhance workforce preparedness and acceptance of new technologies [33].

Collaborative practices of RAC workforces and residents include leading residents and carers to relevant and credible health information websites, information systems and technology tools. Interactions between technology, staff and residents enhances routine care delivery and human contact for residents [37]. These interactions provide access to valuable health information and other resources [37]. Quantifying costs and return on investment, especially related to telehealth services, provides insights into benefits for older people, families, aged care and primary healthcare staff, and overall health and social care systems [19-21, 23, 24, 31, 33, 34, 37, 38]. Alignment of funding and reimbursement, for example in Australia, retaining Medicare telehealth schedule items and highlighting its reach and return on investment can encourage adoption and expansion [19-21, 23].

DISCUSSION

Previous studies of health and social care workforces use of IT have been limited in scope, focusing on specific countries or general issues with technology adoption. For example, Long et al. [9] explored technology use in low- and middle-income countries; Kapaida et al. [10] addressed broader technology adoption challenges in RAC; similarly, Barraclough et al. [11] investigated workforce development in integrated care without emphasising any particular health sectors. A gap in the literature was identified, regarding preparedness of the RAC workforce to effectively use IT. This scoping review identified capability, digital governance, and collaboration are key to workforce preparedness and use of IT. The review offers recommendations to enhance adoption, implementation, and effective use of technology to drive improvement in RAC.

RECOMMENDATIONS

Designing effective digital governance structures for RAC facilities that recognise, embed, and promote workforce capability and collaboration in the context of digital health is essential for improving quality of care and operational efficiency. This scoping review offers the following recommendations.

1. Digital Health Leadership/Champions/Advocates/Ambassador

Appoint digital health leaders within governance structures, comprising team members with expertise in practice, digital health and information and communication technologies. Embedding this into routine practice to lead integration of digital health solutions is imperative [19-22, 24, 26, 32-34, 38].

2. Governance Structures

Recognition of strategic contributions of digital health and information and communication technologies. Governance structures should include representation from clinicians, IT and professional staff, vendors and caregivers. These stakeholders can work collaboratively to evaluate, implement, and optimise digital tools and technologies. A mechanism to involve residents and carers should also be included [23, 26, 33, 37].

3. Capability Assessment and Training

Regularly assess digital competencies of the RAC workforce and identify areas for improvement. Invest and implement ongoing training programs to ensure RAC staff members are proficient in using digital health tools effectively. Ongoing education and training are necessary to adapt for new staff and the introduction of innovative information, communication and digital technology solutions for all [19-21, 23, 24, 26-28, 30-34, 36, 37].

4. Interoperability and Integration

Ensure digital health systems are interoperable, integrated and aligned to support workflows. Collaboration between IT teams, professional and clinical staff is crucial to achieving optimal technology solution use and data exchange [19-21, 23, 27, 28, 33, 36].

5. User-Centred Design

Prioritise user-centred design and usability when selecting and implementing digital health solutions. Involve workforces in decision-making processes to ensure tools meet their needs and are user-friendly. Resident and carer involvement is key to solutions that can promote a healthy lifestyle, connect with families, and support social engagement and entertainment [19-21, 24, 26-28, 32, 35-37].

6. Evaluation of Digital Health Impact

Develop and embed performance metrics for digital health initiatives. Measures should be broader than traditional return on investment/cost benefit and include socio-cultural dimensions. Recognise and reward staff who contribute to successful implementation and utilisation of digital solutions [26, 28, 32, 33, 35]. Implement regular evaluations to assess impact on resident care and operational efficiency. Encourage staff to provide feedback on the usability and effectiveness of digital tools [19-21, 28, 36].

7. Information Governance and Privacy

Establish robust data and information governance policies and privacy protocols to safeguard resident information. Compliance with relevant data protection regulations, such as Health Insurance Portability Accountability Act (HIPAA) (United States of America), General Data Protection Regulation (GDPR) (Europe) and Australia's Commonwealth My Health Record and Privacy Acts and State Government Privacy Acts [19-21, 33, 36].

8. Collaborative Research and Innovation

Foster collaboration with academic institutions, research organisations, and technology partners to engage with digital health innovation. Participate in research projects that explore the use of emerging technologies in RAC [30].

9. Continuous Improvement Culture

Foster a culture of continuous improvement where staff members are encouraged to identify opportunities for introducing and enhancing use of digital health tools. Celebrate successes and learn from challenges to drive ongoing improvement [19-21, 23, 24, 28, 30, 36].

10. Digital Literacy for Residents

Recognise residents and carers can benefit from digital literacy programs to engage with solutions and stay connected with relatives and communities. Offer support and training to residents as needed [19-21, 23, 26, 28, 31, 34, 36, 37].

11. Investment in People, Process and Technology

Financial investment in IT, implementation readiness, and the learning capabilities of RAC workforces is necessary for successful technology adoption [19, 23, 29].

Implementation of these recommendations can establish mechanisms that effectively leverage digital health technology to enhance workforce capability and collaboration, ultimately improving the quality of care and RAC outcomes.

LIMITATIONS

This review was limited to English-language publications, which may exclude relevant studies from non-English-speaking regions, particularly Nordic and European countries with strong RAC research. The search strategy did not include the term eLearning and could have excluded relevant articles on eLearning tools for workforce development in RAC. Utilisation of technology for education and resident management was the least reported among the studies, however this was not the focus of our study and key words to capture this term were not included. This scoping review concentrated on workforce in-service education, not education or training prior to entry to RAC. A further limitation is the non-distinction

between types of digital technology used in RAC by the health and social care by workforces as different educational preparation, training or support is required depending on the setting and technology need.

Included articles may reflect selection bias as processes may be considered subjective. To control for bias at each stage, multiple researchers' opinions were applied, and consensus sought when differences occurred.

CONCLUSION

This scoping review identifies Capability, Collaboration, and Digital Governance as key themes in literature on workforce preparedness and technology adoption in RAC. It emphasises integrating IT capabilities into care provision to derive value from digital health applications. Overcoming challenges in IT partnerships and expertise integration can lead to successful technology adoption. Training and support for RAC workforces can maximise benefits in delivering quality care to residents. This integration promises sustainability and fosters innovation in RAC, requiring policy makers to incentivise training and invest in technology infrastructure for digital transformation. Success requires collaborative environments involving stakeholders, residents, and families in co-creating value through digital technology and strong digital governance. This enables RAC to leverage technology for better care outcomes and residents' well-being. Future research should focus on workforce readiness and IT integration to facilitate a technology enabled, person-centred future in aged care, benefiting both care providers and recipients.

DISCLOSURE STATEMENT

The authors report there are no competing interest to declare.

ETHICS AND DISSEMINATION

Ethics approval was not required for this review, secondary data of previously published data was used.

FUNDING

The authors disclose receipt of 2022/23 College of Business and Economics, University of Tasmania research funds as financial support for the Lead Investigator.

ACKNOWLEDGEMENT

The authors would like to thank the research librarian Brenda Carter at the University of Tasmania, for her assistance identifying appropriate databases, defining and generating search terms for the review.

SUPPLEMENTARY MATERIALS

Detailed information on the search strategies and characteristics of included studies for this research is available by contacting the correspondence author for this publication.

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ASSESSMENT OF THE PRIMARY HEALTH CARE PROCESS IN THE KURDISTAN REGION OF IRAQ: A FOCUSED REVIEW

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ABSTRACT

There is an urgent need to restructure and improve the primary health care system in the Kurdistan Region of Iraq as part of broader health system reforms. However, there is a significant gap in the literature, as few publications provide a comprehensive and structured analysis of the challenges, needs, and opportunities within this system. Therefore, this review addresses this gap by assessing the primary care process component, identifying key barriers, and highlighting opportunities for improvement.

There are significant impediments to primary care delivery. Inappropriate service delivery is primarily due to the irrational use of services, poor referral systems, and irrational treatment. Easy accessibility and almost free-of-charge service delivery are the main features of the access dimension. However, these features frequently result in overutilization and affordability concerns due to the lack of all required services and the reliance on the private sector. The lack of a well-established family medicine system and the inability of people to have a doctor are considered impediments to proper longitudinal continuity of care. The ineffective referral system is a common problem in the current primary care system for the coordination of care. In terms of the comprehensiveness dimension, the primary health care system provides a wide range of primary care services, including preventive and curative health services, but is inadequate in some areas.

Strengthening the primary care process requires establishing a robust family medicine system, improving referral mechanisms, and promoting rational service use to enhance continuity, coordination, and comprehensiveness of care.

KEYWORDS

primary care; challenges; opportunities; process; referral.

INTRODUCTION

Primary care is a key component of a healthcare system as it provides an essential front-line resource for curative and preventive healthcare services, especially for those without other access to healthcare [1]. A robust primary care system is essential to improving the country's health, particularly to eliminate health inequalities. Research evidence is available on the specific contribution primary care can make to improving health outcomes [2].

Primary care can be approached as a system of three complex levels: structure, process, and outcome. Each level consists of several dimensions [3]. The process of a primary care system is a continuous cycle centered on a patient's

needs, from initial contact through ongoing care. The process of a primary care system is determined by four dimensions: access, continuity of care, coordination of care, and comprehensiveness of care [4]. The process of a primary care system is crucial for maintaining long-term health, as it serves as the first point of contact for a wide range of health needs, including prevention, early detection, and the management of chronic conditions. A well-functioning primary care system ensures comprehensive, continuous care, leading to better health outcomes, lower costs, and improved patient-provider relationships. This process helps individuals manage their overall well-being by promoting health, preventing illness, and guiding them through the health system [3,4].

The public, government-run health care system in the Kurdistan Region of Iraq (KRI) consists of a primary care level and a variety of secondary and tertiary hospitals. The former consists of 1,008 primary health care centers (PHCCs), each serving an average population of 6667. About a third (31%) of the centers are staffed by physicians; the rest are smaller centers staffed by nurses or medical assistants [5]. Most nurses have completed secondary nursing school or a two-year diploma after secondary school. The number of university nurses is limited. Medical assistants have completed a special two-year diploma in post-secondary school, mainly in polytechnic universities.

The PHCCs in Iraq provide curative and preventive healthcare services, including curative care (e.g., consultation and prescription) and preventive care (e.g., vaccination, antenatal care, nutrition and growth monitoring, health education, and family planning) [6]. Each PHCC receives 100 patients daily, typically with short consultation times due to overuse of services and inefficient distribution or use of human resources [5,7]. The distribution of PHCCs and staff is generally uneven, with some areas much better served than others [7,8].

The poorly regulated private healthcare sector in the Kurdistan Region of Iraq is consistently growing. It comprises a network of private clinics and hospitals that provide services primarily on an out-of-pocket basis due to the lack of health insurance schemes [9].

The political and socioeconomic events in Iraq during the last few decades had a significant impact on the healthcare system, resulting in an extensive decline in major health indices and leaving a struggling health system unable to address the needs of the population. The primary care system did not escape this devastation and continues to face challenges common to the healthcare system as a whole [10,11].

The health care system in Iraq is hospital-oriented, with little focus on primary care [12]. There is consensus on the poor functioning of the primary care system in Iraq and the urgent need to reorganize and restructure primary care services within the overall health system [13,14]. The primary care system in KRI is under pressure to adapt to the continuously changing, resource-intensive needs of populations with varying morbidity patterns amid prolonged political, economic, security, and humanitarian crises [14]. There is a need to understand the problems and needs of the primary care system in KRI [15]. This understanding can provide Iraqi policy and decision-makers with information on the quality of primary care services, help them identify development opportunities, and guide action to improve the primary care system. While there is an urgent need to comprehensively evaluate Iraq's entire primary healthcare system, a targeted assessment of the process component offers a critical opportunity to identify specific challenges and resource gaps—laying the groundwork for practical, evidence-based improvements in this foundational system. This study reviewed the relevant literature to evaluate the KRI primary care system and determine its challenges, needs, opportunities, and potential barriers to improvement. The two other primary healthcare system levels will be addressed through separate studies. While this study is specific to the Kurdistan Region of Iraq, it can be considered a good case study for other settings in the Middle East and internationally with similar healthcare systems.

METHODS

This focused literature review included full-text articles published in English from 1 January 2010 to 30 September 2025.

The review used major electronic databases, including Medline, SCOPUS, Web of Knowledge, Iraqi Academic and Scientific Journals (IASJ), CAB Direct, and EMBASE. Search terms used included: 'primary care', 'healthcare', and 'health system'; 'Kurdistan Region' and 'Iraqi Kurdistan'; and 'evaluation' and 'assessment'. Both free text and Medical Subject Headings (MeSH) terms were used in Medline. Synonyms and interchangeable terms were connected using 'OR' and 'AND' operators in the search strategy to connect and establish relationships between search terms. The references of the initially selected studies were hand-checked to identify additional studies that the main search may have missed due to gaps in the search strategy or weaknesses in the database indexing systems. A total of 46 studies were identified, of which 25 were relevant and used for this review.

The findings of different studies on the primary care system in KRI are thoroughly discussed collectively under the main theme of process based on Donabedian's conceptual framework of structure, process, and outcome to assess the quality of care [3] and their respective dimensions to evaluate the primary care system as described by Kringos et al. [4].

PRIMARY CARE PROCESS

ACCESS TO PRIMARY CARE SERVICES

The characteristics of primary care services — easily accessible and almost free of charge — make the system appropriate for poor people, and their availability to most people helps reduce the burden on hospitals and other health institutions [16-18]. Smith et al. reported that access to primary care services is not a problem in Iraq, which was considered surprising given the lack of infrastructure, security issues, and sociopolitical barriers [18]. The distance from the residence to the health facility is crucial for accessing healthcare. Khudhairi notably revealed that around 30% of patients reach PHCC by walking [17]. The distance to a PHCC from an individual's residence was a factor in the use of PHCCs across several governorates of Iraq, particularly in the south [19].

Tawfik-Shukor and Khoshnaw raised concerns about affordability, mainly for people who do not find the required services in the public sector and need care from the private sector [20]. However, low user fees and the related overutilization of services could also be considered a negative aspect of the current system. Irrational visits are another problem in the PHCCs in KRI. Low user fees are the main reason for repeated and irrational visits to PHCCs [6,21].

Research from KRI revealed that primary care providers are concerned about the poor organization of health service delivery, which is mainly attributed to the irrational use of primary care services [6,21]. This poor, unorganized primary care system and overuse of services create an unnecessary workload for primary care facilities and providers. This negatively affects the quality of services provided, particularly in provider-patient interaction and communication, as well as the duration of consultation [6,22]. According to MOH-Iraq, each main PHCC in Iraq receives more than 100 patients per day [5]. Khudhairi revealed that each PHCC in Iraq receives an average of 123 patients per day, and each doctor makes an average of 24.5 consultations per day [17]. Al-Dabbagh reported a staffing need ratio of 0.33, indicating high work pressure on medical doctors [22]. Unacceptably short consultation times in PHCCs in Iraq have been reported, mainly due to overuse of services and, subsequently, a large number of patients per doctor hour, as doctors work only 3 hours a day and each has 50-100 consultations [23].

The issue of working hours is a concern for people who ask for longer hours or at least fulfill the official hours, as the official working hours in the PHCCs of KRI are from 8:00 am to 2:00 pm, that is, 36 hours per week. In the rest of Iraq, working hours are from 8:00 am to 3:00 pm, 42 hours a week [24]. However, actual working hours are usually 12-18 hours per week [23]. On the contrary, Burnham et al. reported high satisfaction (74%) among a sample of the Iraqi population with the convenience of primary care clinic hours [25]. However, the latter study involved all types of public and private primary care clinics, which may explain this high satisfaction rate. According to Tawfik-Shukor and Khoshnaw, the short clinic hours at primary care centers in KRI and the late arrival and early departure of physicians sometimes result in long patient queues outside the centers [20].

Poor infrastructure and the need to increase the number of PHCCs to meet population needs have been emphasized in KRI research [21,26]. On average, there are 0.7 PHCCs per 10,000 people, which is low compared to international standards and neighboring countries' two to three per 10,000 [5]. The expansion of public health facilities in the KRI region is encouraging, in contrast to the slow pace of improvement in other parts of Iraq, primarily due to the dreadful security situation. However, much remains to be done to meet the standards of neighboring countries [27].

While many people visit PHCC, most seek preventive measures, and a low proportion seek basic medical treatment [11]. The population's criticism of PHCC services primarily concerns poor access to and organization of primary care services [24]. Some studies from Iraq revealed good overall satisfaction with primary care services, but they have also reported poor organization of services, primarily due to the long waiting time [17,25]. People eventually turn to private services when they are dissatisfied with public services [28]. The Iraqi people, particularly the wealthy, commonly use widely available, easily accessible private health services [25]. The primary benefits of the private sector include access to consulting specialists who are not always available in PHCCs, receiving high-quality care, and better interaction with providers [24]. There is a high preference for using private health services for primary care in Iraq compared to PHCCs [17,25]. The percentage of the population attending PHCCs in Iraq ranges from 3% to 26%, which is considered low compared to other countries [5]. On the contrary, Habib and Vaughan reported that overall service utilization in PHCCs in southern Iraq was sufficient in 1985, before the health system began to deteriorate [29].

Patient dissatisfaction is an important challenge in the use of PHCCs [19]. Some people have poor satisfaction with primary care services, but they mostly continue to use them. This could be the point for people with low incomes who might not be able to afford private-sector services [24]. The PHCCs are nearly free of charge and should not pose a financial burden to those using them. However, the financial burden is often highlighted by rising health expenditures associated with increased reliance on private services [24]. Burnham et al. also reported difficulties in providing health care in Iraq, revealing a relatively high proportion of families (24.3%) with catastrophic health expenditures during the month preceding that study [25].

There is a wide range of variations in satisfaction with primary care services [24]. Burnham et al. reported that the Iraqi population was highly satisfied (75%) with primary care services, with no significant difference between PHCCs and private clinics [25]. Khudhairi also revealed a high satisfaction (79%) among a sample of people in Baghdad with public primary care services [17].

CONTINUITY OF PRIMARY CARE

The lack of a well-established family medicine system and the inability of people to access primary care doctors have been emphasized in the KRI research [6,21]. This can be considered an impediment to proper longitudinal continuity of care. If a patient does not improve and needs to go back to the same PHCC, he may not see the same first doctor and may receive completely different treatment due to the lack of use of medical records [6]. This is an example of poor longitudinal continuity of care. On the other hand, most people can, to some extent, call a doctor they know to get advice on their illness. This includes physicians from the private sector, who generally consult and maintain better interpersonal relationships [24].

The improper use of information technology in PHCCs in Iraq was highlighted by Lafta and Khudhairi, who found that only 10 of 30 PHCCs had computers [15]. The study also noted the inefficient use of computers in PHCCs that have them. Another study similarly reported a lack of consistent medical record systems in PHCCs and hospital outpatient departments, with substandard medical charting quality [23]. Although the importance of integrating information technology into the primary care system in KRI has been revealed in research [6,21], the main concern is related to organizing health services, proper disease reporting, and improving communication with the DOH rather than keeping and using medical records of patients and coordinating patient care with secondary levels of health care.

While availability and physical access are important, patients' perceptions of the quality of care during the patient-provider encounter are recognized as playing an important role in health-seeking behavior [30]. Poor patient-provider

relationships are described as one of the main reasons for recognizing disease treatment as the worst functioning service in PHCCs [21]. Khudairi also reported poor patient-provider relationships, including improper clinical examination, treatment instructions, and patient education [17]. Burnham et al. similarly reported poor patient-provider relationships, with approximately 64% of study participants feeling that staff members in primary care centers are too busy to give adequate attention to their medical problems [25].

COORDINATION OF PRIMARY CARE

In general, having an ineffective referral system is a common problem in the current primary care system. A survey in Erbil found a low referral rate from PHCCs to secondary care (6%) and a high rate of self-requested referrals (38%) [31]. A higher referral rate has been reported in the Duhok governorate of Iraq (15%) [32].

The referral rate from primary care to secondary care settings is expected to vary, which is usually challenging to explain [33]. However, the referral rate in KRI is comparable to that in other settings with efficient referral systems, with reported referral rates of 4-5% [34,35].

Under-referral from physicians to specialists is commonly reported in developing countries. In contrast, over-referral is more commonly reported in developed countries, primarily due to increased medical costs [36]. In practice, inappropriate referral is more important than the referral rate; however, it is difficult to study [33,37].

In principle, the health needs of most patients can be met in a primary care setting [2]. When the primary health problem cannot be managed, the primary care physician should decide to refer the patient to a specialist. Self-requested referrals or self-referrals to a secondary care setting will result in inefficiencies in the system. If secondary care physicians become overwhelmed by inappropriate self-referrals, some disadvantaged patients may lack specialist care [38].

More than one-third of referrals to KRI are self-request [31]. As a rule, the KRI health system does not permit self-referrals; patients must have a referral from PHCC, an emergency hospital, or a private physician clinic for secondary care services. Such a mechanism might lead to a high rate of self-referrals. Enforcement of such a referral rule is relatively weak and cannot control all self-referrals. Some patients can still visit secondary care settings without obtaining a referral [39]. The high self-requested referral rate indicates a tendency for people to seek direct care in secondary rather than primary care settings. A high proportion of referred patients are seen in the secondary care setting on the same day of referral, indicating easy access to secondary care. Referral feedback from secondary to primary care is lacking in Iraq [32].

The findings of Erbil referral survey approximate the pattern of referral to specialty reported by previous research [34,40]. The survey revealed a high rate of self-requested referrals to otolaryngology and pediatric departments.

Other studies also emphasized the poor referral system in Iraq. For example, Younus revealed a high rate (15.4%) of patients referred from primary care to secondary care in Duhok City; half of the referrals are inappropriate, and the accompanying referral document frequently does not provide essential information, such as the name of the referee and the reason for the referral [32]. Shabila and Al-Tawil revealed a relatively high proportion of non-referred patients (25.4%) in the secondary care setting [39]. Among those referred, 30.6% were self-requested referrals, and only 26.4% were referred from PHCCs. Al-Shatari et al. reported that 80% of hospital doctors in 9 Iraqi governorates lacked coordination with primary care doctors and considered the current referral system ineffective. They considered patient crowding and doctor shortages in PHCCs as causes of PHCCs not adequately filling the referral form [41].

The preference to consult a specialist rather than a general practitioner is common among KRI people [24]. Several factors result in this specific preference for specialists. The Iraqi health system has historically been based on a hospital-oriented model that mainly relies on specialists. General practitioners in Iraq lack formal postgraduate training. Specialists are commonly assigned PHCCs due to the increased number of specialists and the limited number of hospitals [7]. Patients can visit private-sector specialists without referrals.

In an ideal situation, PHCCs should be run by family medicine or general practitioners. However, specialist physicians serve in most main PHCCs, while nurses or medical assistants staff most small PHCCs. Iraq and the Kurdistan Region of Iraq have seen an increase in specialists over the last two decades. With limited working places in hospitals and consulting centers, many specialists are assigned to work in PHCCs [6].

In KRI, many people visit a specialist of their own choice based on their symptoms [24]. Such health-seeking behavior rules out the importance of the general practitioner or family doctor's coordinating and gatekeeping role. It leads to excessive use of specialist services and an unnecessary increase in people's financial burden [34].

COMPREHENSIVENESS OF PRIMARY CARE

PHCCs in Iraq are set to provide a wide range of primary care services, including preventive and curative health services: antenatal care, immunization, growth monitoring, simple diagnostic investigations, basic dental services, and case management [7]. In principle, many of the services presented in the WHO-MOH Basic Health Services Package for Iraq are currently being provided at the main PHCCs but not at all levels and need to be strengthened [5]. For example, the package includes several programs or services that are rarely offered in PHCC, such as delivery service, mental health, emergency services, tuberculosis and chronic disease programs, food safety, and environmental health, while many items in the essential list of medications and the comprehensive list of diagnostic investigations are currently lacking. Moreover, the available services suffer from many shortcomings and challenges. Many PHCCs, particularly those in Erbil, have specialists in different specialties. However, PHCCs lack the appropriate equipment and investigation to allow these specialists to work properly [6]. Sometimes, even with equipment such as X-ray machines, PHCCs may lack the skilled staff to operate them.

CONCLUSIONS

This review thoroughly explains the factors that positively and negatively affects the primary care process in KRI's primary health care system. Positive aspects include several programs that work properly, such as antenatal care and immunization, low use fees, and easy accessibility. However, the primary care system faces enormous challenges, primarily related to poor service delivery. Strengthening the primary care process requires establishing a robust family medicine system, improving referral mechanisms, and promoting rational service use to enhance continuity, coordination, and comprehensiveness of care. The positive experience with several pilot family medicine projects underscores the need to shift the primary care system from PHCCs to family medicine centers for long-term improvement. However, such reform might be costly and require substantial resources, including specialized medical and non-medical workforces. Improvement within the current system through interventions directed to overcome the significant problems in the system, like reorganizing the services, the establishment of an effective referral system, and regulation of public-private partnerships together with the integration of the main elements of the MOH-WHO recommended basic health services package for Iraq might be considered a more practical and less costly solution, particularly as a short-term improvement.

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ESTABLISHMENT OF AYUSHMAN BHARAT HEALTH AND WELLNESS CENTERS IN INDIA: A SYSTEMATIC REVIEW USING THE ANTECEDENTS, DECISIONS AND OUTCOMES (ADO) FRAMEWORK

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ABSTRACT

Access to quality healthcare is a fundamental human right and a cornerstone of Sustainable Development Goal (SDG) 3- Good Health and Well-being. As the global focus on Universal Health Coverage (UHC) Intensifies, India faces significant challenges in ensuring equitable health access. In response, India launched Ayushman Bharat Health and Wellness Centres (AB-HWCs) to strengthen primary healthcare, expand coverage and accelerate the progress towards UHC.

However, while considerable research has examined AB-HWCs, a comprehensive synthesis of their implementation challenges, service delivery outcomes, and system readiness is still needed. This study systematically reviews existing research on AB-HWCs to assess their impact on healthcare accessibility, disease prevention, barriers, and the development of these centres. Using a structured literature search across Scopus and Google Scholar, 37 relevant studies were analysed through the Antecedents, Decisions, and Outcomes (ADO) framework, following the PRISMA guidelines.

Findings reveal gaps in healthcare infrastructure, lack of trained healthcare workforce and disparities in delivery. The study highlights the need for policy refinements, enhanced resource allocation, micro level impact assessments and better integration of technology.

KEYWORDS

ayushman bharat, health and wellness centre, India, literature review, systematic, universal health coverage

BACKGROUND

Health is the underpinning and the inevitable input in the social sector of an economy. United Nations Sustainable Development Goals serve as the guideline for the development activities of the world and Goal 3 among them focuses on “ensuring healthy lives and promoting the well-being for all at all ages” [1]. Globally, the objective of Universal Health Coverage (UHC) is to ensure that all people have access to basic healthcare without incurring financial adversity. It aims

to address the deficiencies related to health equity, bridge the vertical and horizontal disparities. In Kenya, an integrated non-communicable disease (NCD) model, along with self-management devices and a digital health wallet (M-TIBA) for co-payment, was implemented [2]. Ghana executed a national health insurance scheme in 2005, and Rwanda integrated community-based health insurance (CBHI) in the national plan in 2015 [3]. Philippines has launched the 'sin tax' on alcohol and tobacco to gather more funds [3]. In Ethiopia, the Health Extension Program employed over 35,000 village-level community health workers to teach people healthy lifestyle habits and offer basic medical care [4]. A robust primary healthcare network can serve first point of contact and well integrate with the micro settings [5].

India continues to face a rising disease burden despite global health goals, with Non-Communicable diseases (NCDs) accounting for 74% of the total disease load [6]. Additionally, a significant number of households remain vulnerable to financial distress due to health care expenses, as over 60% of Catastrophic health expenditure (CHE) are met through out-of-pocket payments, primarily for diagnostics [7]. In line with worldwide recommendations, the Government of India introduced the National Health Policy(2017) and the Ayushman Bharat Mission (ABM) in 2018 to ensure comprehensive healthcare [8]. The ABM stands on two main pillars: (i) Pradhan Mantri Jan Arogya Yojana (ii) the upgradation of the existing sub-centers (SCs) and primary health centres (PHCs) into health and wellness centres (HWCs) under the scheme.

The National Health Policy envisioned the establishment of 1,50,000 Health and Wellness Centres (HWCs) to provide comprehensive primary healthcare services, a critical step toward achieving UHC. Sub-centres are planned to serve a population of 5,000 individuals (3,000 in difficult-to-reach areas), while primary health centres (PHCs) in both urban and rural settings will cater to populations of up to 30,000.

The upgraded HWCs will offer an expanded range of essential services, including family planning, communicable disease management, screening, prevention, control, and treatment of non-communicable diseases, mental health support, counselling, and oral healthcare. This study aims to provide a systematic and comprehensive review of the existing facilities and cover studies relating to the Ayushman Bharat-Health and Wellness Centres (ABHWCs) while synthesizing the perspectives of both the demand and supply sides.

The World Health Organisation's six building blocks are: leadership and governance, health financing, service delivery, health workforce, medical products, vaccines, technology, and health information systems. The upgradation to health and wellness centres involves strengthening of the WHO building blocks by employing community health officers and providing multiple packages of services. This includes the management of non-communicable diseases, screening of cancers, mental health counselling and so on. The location of the centres in proximity to the community and free of cost provision of treatment ensures the mitigation of unmet health demand. These aspects boost service delivery.

To fully understand the potential impact of this flagship intervention, it is essential to analyze it not merely as a standalone policy but as a dynamic process shaped by specific contexts and strategic choices. The Antecedents, Decisions, and Outcomes (ADO) framework provides a robust analytical structure for this purpose. The antecedents shape the factors that led to the creation of AB-HWCs. Decision help in understanding the design of the program and the outcomes encompass provider experiences and community responses. The HWC initiative was implemented in lie to the antecedent of growing burden of non-communicable diseases and dearth of expert health professional in rural and remote area. The decision to include a mid-level health provider and the use of technology in medicines is a strategic and critical. The aim is to engage in early detection of non-communicable diseases, mental health issues and develop a two linkage between the primary centres and the secondary and tertiary care.

Therefore, the primary objective is to systematically synthesize and evaluate the available peer-reviewed literature on the implementation, services, and outcomes of Ayushman Bharat Health and Wellness Centres in India. This review includes literature from both demand and supply side. The secondary aim is to understand the enablers, barriers to the sound working of HWCs and gauge the scope of future research.

METHODS

This study employs a systematic review approach using the lens of ADO to analyze the existing research on AB-HWCs, focusing on their implementation, effectiveness, challenges, and potential to strengthen primary healthcare in India. The inclusion of multi-faceted studies on utilization, quality of care, health providers' knowledge, availability of facilities, and community perspectives widened the scope of review. This is important for a large scale healthcare intervention.

SEARCH TERMS

A comprehensive literature search was conducted in January 2025 using Scopus, the world's largest database(9), and Google Scholar, a widely used search engine for academic studies. The search terms employed were: "Ayushman Bharat Health and Wellness Centre" OR "ABHWC" OR "Health and Wellness Centre". The search was restricted to title, abstract, and keywords, yielding a total of 209 documents, of which 87 were retrieved from Scopus and 122 from Google Scholar.

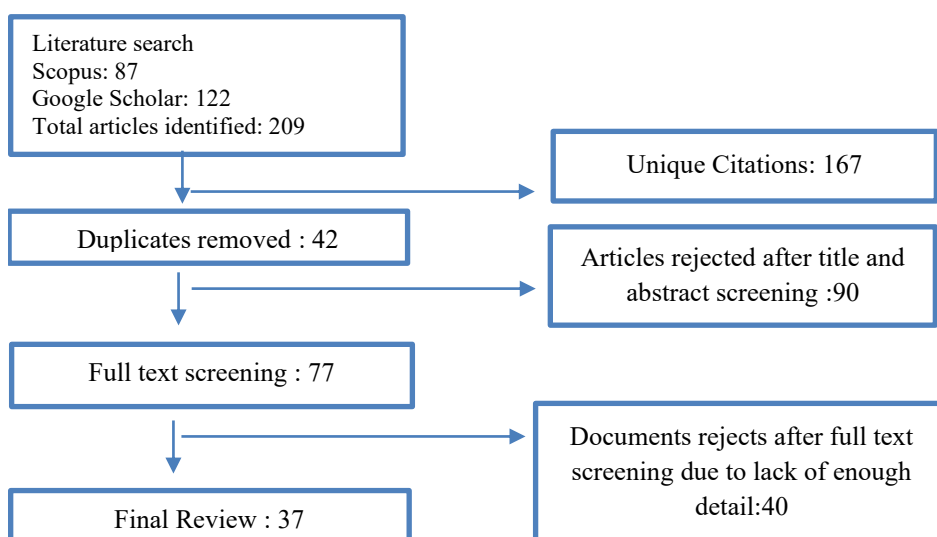
STUDY SELECTION

A multi-step screening process (refer to Figure 1) was applied following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines(10). Amongst the 209 documents gathered from the two databases, 42 records were identified and eliminated, leaving 167 unique studies. These studies underwent a preliminary screening of title and abstract based on relevance to the study objectives. 90 studies were excluded as they did not align with the research focus, reducing the dataset to 77 articles. A final review was conducted based on the following criteria:

Inclusion Criteria: Studies published between 2018 and 2025 (as AB-HWCs were introduced in 2018) and those addressing key themes relevant to primary healthcare implementation in India.

Exclusion Criteria: Studies lacking focus on the core components of the AB-HWCs. 40 studies were excluded at this stage due to the absence of a clearly defined underlying theme. 37 studies were selected for in-depth analysis.

FIGURE.1 PRISMA(PREFERRED REPORTING ITEMS FOR SYSTEMATIC REVIEWS AND META-ANALYSES) FLOW DIAGRAM FOR ABHWCS

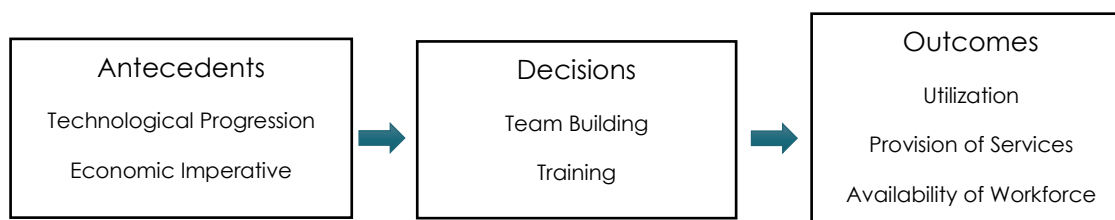


ANALYTICAL FRAMEWORK

The study examines the implementation of Ayushman Bharat-Health and Wellness centres through the lens of the Antecedents, Decisions and Outcomes (ADO) framework(10). The antecedents ('A' of ADO) refer to the foundational factors that determine the success or failure of the AB-HWCs implementation. These include institutional readiness, policy frameworks, funding mechanisms, and socio-economic determinants that shape the trajectory of upgradation efforts. The decisions ('D' of ADO) encompasses the strategic actions undertaken to facilitate successful implementation. This includes financial allocations, policy interventions, adoption of standardized protocols, capacity-building initiatives, and

innovative health care delivery models. Notably, such studies have highlighted key measures such as training programs and technological advancements that have played crucial role in enhancing service delivery within these upgraded health centres. The outcomes (O' of ADO) capture the impact of these decisions on both demand and supply side of healthcare services.

FIG. 2 ANTECEDENTS, DECISIONS, AND OUTCOMES (ADO) FRAMEWORK



RESULTS

ANTECEDENTS

The antecedents of AB-HWCs serve as key drivers influencing the establishment and subsequent impact of healthcare accessibility and outcomes.

ECONOMIC IMPERATIVES

Economic factors are among the most significant drivers for upgrading sub-centres and primary health centres (PHCs) into AB-HWCs. In India, Out-of-pocket expenses (OOPE) remain the predominant mode of healthcare financing, constituting 59% of the total health expenditure [11]. This financial burden often results in catastrophic health expenditures, pushing an estimated 60 to 80 million individuals into poverty annually (8). The National Health Policy (NHP), 2017 sought to address these challenges by prioritizing primary healthcare, allocating two-thirds of the healthcare budget to this sector. Further, the 15th Finance Commission allocated ₹70,051 crores over five years (until 2026) to strengthen the HWC infrastructure and diagnostic facilities [12]. These financial provisions are intended to expand healthcare coverage and reduce economic disparities in healthcare access.

TECHNOLOGICAL ADVANCEMENT IN PUBLIC HEALTH

Technological innovations are pivotal in strengthening public health infrastructure and service delivery under AB-HWCs. Given India's vast and diverse population, digital transformation in healthcare is essential for improving healthcare accessibility and efficiency. The Ayushman Bharat Digital Mission (ABDM), launched in 2020, aims to establish a unified digital health ecosystem by creating health IDs for citizens and integrating them with existing health programs [12]. Interoperable digital health records, telemedicine platforms, and AI-driven analytics can facilitate real-time patient monitoring and improve disease surveillance [13]. Moreover, primary healthcare providers at HWCs act as critical facilitators in implementing digital health solutions, bridging the gap between remote populations and specialised medical care.

Telemedicine is a particularly transformative intervention, enabling virtual consultations with expert physicians, expediting diagnosis, and ensuring timely medical interventions. Community health officers (CHOs) stationed at HWCs leverage telemedicine platforms to provide specialised care in remote and under-resourced regions (14). This integration of technology significantly enhances the efficiency, equity, and reach of healthcare services in India's rural and semi-urban landscapes.

GOVERNANCE AND POLICY FRAMEWORK

The governance dimension of AB-HWCs revolves around the provision of comprehensive primary healthcare, which is a fundamental expectation from public health policy. The establishment of a robust network of public healthcare facilities is a prerequisite for universal health coverage (UHC) [15].

The adoption of digital health technologies and improved financial allocation models are essential governance strategies for successful execution of the AB-HWC model. The integration of telemedicine services under this framework further reinforces healthcare accessibility, allowing individuals, particularly in rural areas, to seek remote medical consultations, and preventive screenings[14,16].

SOCIAL DETERMINANTS OF HEALTH AND COMMUNITY ENGAGEMENT

The social drivers influencing the AB-HWCs implementation emphasize the need for expanding the primary healthcare network, particularly in underserved and marginalized communities. Infrastructure expansion, workforce development, and service delivery enhancement are critical components in ensuring that primary healthcare systems meet the growing demands of the population[17].

Currently, the primary health centres and sub-centres serve only 20% of the healthcare needs, primarily focusing on Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) services[13]. The transition to AB-HWCs is designed to broaden the scope of primary healthcare services, incorporating NCDs management, hypertension and diabetes screening, oral care, Ear-Nose-Throat (ENT) related treatment, mental health services and comprehensive diagnostic support[13]. This expansion is critical in addressing the epidemiological shift towards chronic diseases, which pose an increasing burden on India's health system. While financial investments and digital interventions have strengthened primary healthcare services, challenges remain in ensuring seamless integration, equitable access, data management and workforce upskilling.

DECISIONS

In this study, the decisions are the structural constructs of the upgrade process of AB-HWCs. These decisions are linked to the antecedents and the subsequent outcomes, shaping operational efficiency and strategic direction.

BUILDING A PRIMARY HEALTHCARE TEAM:

Each SC-HWC is staffed with a Mid-Level Health Provider (MLHP), also known as a Community Health Officer (CHO), along with one male Multi-Purpose Worker (MPW), two female MPWs, and Accredited Social Health Activists (ASHAs) per 1,000 population[13]. Similarly, each PHC-HWC includes a Medical Officer in Charge (MoC), a staff nurse, a lab technician, a pharmacist, and a Lady Health Visitor[Bajpai & Wadhwa, 2019]. The institutionalization of the CHO/MLHP strategy has been reinforced by its inclusion in the National Medical Commission (NMC) Act of 2019, which provides restricted prescribing permissions [15]. Since prescription-writing authority is exclusive to registered medical practitioners, the nurses serving as CHOs are not authorized to prescribe medications[18].

TRAINING OF FRONTLINE WORKERS

To overcome the shortage of skilled human resources, the Government of India introduced the 'Certificate in Community Health' bridge course to train nurses to qualify as MHP/CHO [19]. The Bridge Programme on Certificate in Community Health for Nurses (BPCCHN) enhances professional competence through structured training and assessment. A study at a medical College in Loni, Maharashtra, found that 110 CHOs who underwent training improved their test scores from 60% to 96%, demonstrating the program's effectiveness[20].

STREAMLINING WORKFLOWS

Few studies have examined the best innovative practices at AB-HWCs. One of the studies found that the implementation of the E-Sanjeevani teleconsultation platform allowed the CHOs to virtually consult specialists, improving diagnostic accuracy and treatment decisions in the Bhandara District, Maharashtra [21]. Another good practice was the systematic scheduling of the weekly outreach activities such as immunization, family planning, NCD screening, and NCD confirmation which enhanced service efficiency.

OUTCOMES

The outcomes are the consequences of the inputs and the mediators.

PROVISION OF HEALTH SERVICES

A study of five SC-HWCs and PHC-HWCs found that screening for NCDs such as cervical, oral, and breast cancer was inadequate [22]. An assessment of 404 HWCs in Chhattisgarh revealed that the monthly average Outpatient department (OPD) visits were 358, which included 128 NCD patients. As a consequence, HWCs met 31% of the outpatient care needs, including 26% of hypertension management and 21% of diabetes care [23]. However, services for chronic respiratory diseases and mental health conditions were significantly lacking [23].

In the Rajgarh district, Madhya Pradesh, 90% of the health providers had not received any training in mental health services, and the HWCs lacked connections with psychiatric specialists and counsellors [24]. On the contrary, another study pointed that 35 rural primary health centers (PHCs) and 8 urban PHCs in western Odisha were well staffed with nurses, lab technicians, drugs and essential IT infrastructure [25]. Furthermore, a cross-sectional assessment of health and wellness centers (HWCs) in Punjab showed that the diagnostic screenings and OPD visits had increased from 2019 to 2021 reflecting on the success and contribution of these centres [26].

The decentralization of India Hypertension Control Initiative (IHCI) in Pune resulted in 3,94,038 hypertension registrations in 2018, with 69% of patients under ongoing care by 2022. Around 50% of these patients received care from the HWCs. In Punjab and Maharashtra, BP control rates rose from 20% in 2019 to 58% in 2022, while missed visits decreased from 61% to 26% in 2022 [27].

AVAILABILITY OF WORKFORCE

Studies indicate a shortage of 19% in Sub-Centres, 22% in PHCs and 30% CHCs [13]. With approximately 63,250 doctors graduating annually in India, only one-third pursue post-graduate training [19]. Additionally, 7,504 Auxiliary Nurse Midwives (ANMs), 75,907 male MPWs and 1,58,417 counselors are needed to meet the demand [28]. A survey in Bihar, Jharkhand, Chhattisgarh, Rajasthan and Himachal Pradesh revealed that HWCs exhibited lower absenteeism and better staffing levels than conventional sub-centres, though overall transformation remains inconsistent across states [29].

UTILIZATION AND RELATED FACTORS

A survey of 400 participants in Odisha revealed that only 31% respondents utilized HWCs and also revealed that low education, proximity (within 2 km) of HWCs, and general health status influenced the utilization rates [30]. In Arunachal Pradesh, 7,003 individuals underwent NCD screenings between April 2018 and September 2019; with oral cancer screenings being most common at 2,875 [31]. However, some tribal women in Maharashtra avoided screenings for NCDs and cancers due to concerns about social stigmas related to being unwell [32]. Due to cultural influence, patients preferred visiting a Bhagat (faith healer) as they had more trust in him.

Community-based study in Chhattisgarh highlighted the need for improved hypertension and diabetes management while identifying persistent challenges in oral care, mental health and injuries [33]. Moreover, the referrals from HWCs were observed to be scanty, the patients found the processes cumbersome and preferred using the public primary healthcare system only if it was functional and well equipped [33].

TIME MANAGEMENT

A survey of 197 HWCs in Mizoram disclosed that CHOs spent about 5 hours per week on the treatment of general illness and communicable diseases, 4.9 hours per week on childbirth and pregnancy, and about 4.5 hours per week on emergency cases. Additionally, 4 hours per week were allocated to NCD screening and vital testing such as blood pressure and blood sugar monitoring [34]. A time-motion study conducted in Punjab exhibited that CHOs worked an average 5.7 hours per day, with 57% of this time dedicated to service delivery [35]. Similarly, ANMs spent 4.9 hours per day, with 62% of their time being productive. CHOs allocated approximately 40% of their time to NCD management, while ANMs dedicated 51% of their time to maternal, neonatal, infant and adolescent care [35]. To optimize time utilization, government expenditure could be integrated with other health programs such as Rashtriya Bal Swasthya Karyakram, Rashtriya Kishore Swasthya Karyakram, National Programme For Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS), Shaala Siddhi and Mid-Day Meal program [13].

KNOWLEDGE AND SKILLS OF THE HEALTHCARE WORKERS

Skill gaps in healthcare delivery have been observed across the states of Karnataka, Maharashtra, Tamil Nadu, Kerala, Andhra Pradesh, Madhya Pradesh, and Uttar Pradesh. Addressing these gaps requires strengthening nursing schools, increasing the number of trained nurses, expanding hands-on training, widening the syllabi, and curricula [17].

A study in Dahanu Taluka, Palghar District displayed significant awareness of NCDs among ASHAs which attributed to targeted NCD training [32]. However, only one of the four CHOs interviewed had received training in oral cancer screening. While most CHOs maintained cancer patient records in registers or digital formats, there was variability in training levels. Similarly, in Medinipur District, West Bengal, 68.8% CHOs exhibited adequate knowledge of palliative care while 31.2% had inadequate knowledge [36]. The study also found that CHO with previous experience and better education had better knowledge. CHOs in Chhattisgarh demonstrated strong acquaintance in diabetes, hypertension, and malaria but lower proficiency in conditions such as diarrhea, vulvo-vaginal candidiasis, and pre-eclampsia [37].

Infrastructure: An assessment of 32 SC-HWCs in Raipur, Chhattisgarh, revealed critical deficiencies in physical infrastructure, diagnostic services and healthcare workforce availability (38). Furthermore, challenges relating to low connectivity and inadequate training continue to hinder the effective implementation of e-sanjeevani or teleconsultation (39). A study in Palghar, Maharashtra identified a lack of access to basic amenities such as potable drinking water and reliable power supply in some sub-centres [32]. Additionally, shortages of essential medications, such as antihypertensive and antidiabetic drugs, were reported in certain HWCs. Although both digital and manual sphygmomanometers were generally available, the inadequate supply of haemoglobinometers, glucometers, and the essential test strips needed for NCD screening posed further challenge [32].

Biomedical Waste Management is another important vertical. A study assessing nine AB-HWCs in Chikballapur District reported significant gaps in biomedical waste disposal knowledge, infrastructure, and transport facilities [40].

Cohesion in working : Out of the 670 CHOs surveyed in Madhya Pradesh, 40% believed that the service delivery at their HWC is below optimum levels due to inadequate cooperation from ANMs, ASHAs or other staff (Kumar, 2021). A study suggests reinterpreting the roles of medical personnel at various levels to enhance teamwork [42]. Additionally, tensions between ANMs and CHOs have emerged following the transition of sub-centres into HWCs, with ANMs now reporting to CHOs, which may impact collaboration [43]. Further, Ayush-qualified CHOs reportedly receive higher OPD footfall, which could affect team morale [43]. A study in Dahod, Gujarat, also identified interpersonal challenges, with CHOs experiencing excessive workloads and inadequate support from team members, leading to suboptimal service delivery [44].

Further, a study assessing the performance of 670 CHOs in Madhya Pradesh revealed that 66.6% of respondents were compelled to undertake additional administrative tasks imposed by district and block authorities, thereby impacting their productivity and core service delivery at HWCs (Kumar, 2021). Effective healthcare delivery necessitates both horizontal and vertical collaboration among personnel [7]. However, the CHOs are limited to dispensing medications prescribed by physicians, which may erode trust within the community, as conditions manageable at the primary care level must still be referred to higher centers, prolonging patient acceptance of CHOs as competent medical professionals [7].

TELEMEDICINE

Teleconsultation services were also running in 88% of urban HWCs and 60% of rural HWCs [25]. However, frontline healthcare workers are not traditionally accustomed to using digital technology in healthcare settings, adapting to telemedicine a gradual process [16]. Despite its growing presence, E-Sanjeevani is currently accessible to only 50% of the Indian population. Despite the availability of teleconsultation devices in the wellness centres across the districts of Himachal Pradesh, their utilization remains suboptimal [22].

Studies highlight several challenges associated with E-Sanjeevani, including inadequate continuity of care, resource constraints affecting sustainability, concerns over patient confidentiality, a persistent digital divide, and legal ambiguities

surrounding telemedicine practices [45]. Strengthening the Digital Information Security in Healthcare Act (DISHA) could provide a more robust framework for ensuring secure telemedicine implementation, ultimately alleviating stress on the healthcare system[45].

In the context of screening, the Community-based Assessment Checklist (CBAC) forms, essential for screening purposes, were found to be filled inconsistently at HWCs in the hilly areas of Himachal Pradesh [22]. Given the importance of documentation as a performance metric, such deficiencies can hinder data-driven decision-making [22]. Furthermore, telemedicine platforms like E- Sanjeevani could be enhanced with digital health record repositories such as e-Manas, facilitating expert consultation and long-term patient care management [45].

COSTING OF HEALTH SERVICES

The financial viability of ABHWCs is crucial for long-term sustainability. A costing study conducted across 93 SHCs and 38 PHCs used bootstrapping methods to estimate the mean per capita cost of comprehensive primary health care services, which stood at ₹333 in SHCs and ₹253 in PHCs [46]. At full utilization (100% occupancy), the per capita cost could rise to ₹390. Similarly, an analysis of eight HWCs in Gujarat showed that while the cost of service delivery increased following infrastructure upgrades, outpatient footfalls also rose significantly, resulting in a net decrease in the cost per Outpatient visit[47]. In Balva SC, the cost per OPD consultation declined by 45%, while in Daliya SC, it fell by 62%[47].

DISCUSSIONS

The findings of this study suggest that despite AB-HWCs facing certain operational challenges, they are a promising trajectory for providing comprehensive care. Infrastructure installations and resources such as beds, drugs, injectables, and the availability of manpower is important for community trust. Steadily opening the centre for more hours, especially for pregnant women, could be an important binding factor. The effectiveness and efficiency of the centres are contingent on critical factors such as workforce training sessions, need-based protocols, and strategic implementation.

A study in Punjab, highlighted the model of HWCs which incorporated weekly team learning sessions, demonstrated a significant increase in monthly NCD screenings from 63 to 328 [26]. This suggests that structured capacity-building initiatives can substantially enhance service delivery compared to non-model HWCs. A critical strategy for management of screening involves equipping frontline health workers, ASHAs, with diagnostic tools, such as spirometers to facilitate early detection and intervention at HWCs [48].

Telemedicine has emerged as a transformative tool for improving healthcare access particularly benefitting women who may face mobility and socio-cultural constraints. However, significant challenges persist, including high rates of over-referrals, limited digital literacy, and inadequate digital infrastructure in rural regions. By strengthening the operational framework of HWCs and fostering data-driven decision-making, India can move closer to building an inclusive and resilient primary health care system.

Our finding that drug availability, diagnostics and skilled workforce remains a critical barrier directly impacts the service delivery in WHO's building blocks model. It tends to suppress demand even when services are nominally free. This also reflects the long-standing challenges of public health system in India. This comprehensive review showcases that while the foundational blocks are being laid, the success of health and wellness centres depends on two pillars. It requires the supply side robustness as well as an understanding of the pre-disposing and enabling characteristics of communities.

IMPLICATIONS FOR POLICY & PRACTICE

For a robust and sustainable primary healthcare system, two critical elements are: continuous monitoring and systematic mentoring. There is potential for longitudinal region-specific studies utilizing mixed-methods studies. Integrating quality metrics across all HWCs will be essential to ensuring standardised service delivery and improving patient outcomes.

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MAPPING INTERNATIONAL RESEARCH ON DOMESTIC VIOLENCE AND WOMEN'S MENTAL HEALTH IN CHINA (2000–2024): TRENDS, THEMES, AND COLLABORATION

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ABSTRACT

BACKGROUND

Domestic violence poses a persistent global challenge to public health, deeply affecting women's mental well-being. While growing international attention has turned toward the Chinese context—marked by legal reforms and rising academic output—a coherent, data-driven synthesis of the field's thematic contours and collaborative dynamics remains absent.

METHODS

We conducted a bibliometric analysis of 184 English-language articles indexed in Web of Science and Scopus (2000–2024). Using Biblioshiny and VOSviewer, we mapped research output, institutional and geographic trends, international collaboration, and thematic evolution across two decades.

RESULTS

Following the enactment of China's Anti-Domestic Violence Law in 2016, scholarly production surged. China and the United States emerged as central contributors, with Hong Kong institutions bridging international networks. Thematic trajectories revealed a shift from descriptive epidemiology to focused engagement with trauma recovery, gender-responsive approaches, and culturally informed care strategies.

CONCLUSION

This study offers the first comprehensive bibliometric mapping of global research on domestic violence and women's mental health in the Chinese context. By delineating evolving research priorities and intellectual linkages, it highlights the growing integration of localized social issues into global health governance discourses. These findings may inform evidence-based service planning, cross-cultural knowledge exchange, and trauma-informed mental health policymaking.

KEYWORDS

domestic violence; women's mental health; china; bibliometric analysis; international research trends; trauma-informed care

INTRODUCTION

Domestic violence remains a persistent global public health concern and a grave violation of human rights, with significant implications for women's mental health [1]. For the purposes of this study, "domestic violence" (DV) is used as a broad term encompassing physical, sexual, psychological, and economic abuse within a family or household context [2]. A significant and frequently studied subcategory within this field is "intimate partner violence" (IPV), which refers specifically to violence perpetrated by a current or former spouse or partner [3]. While this paper maintains "domestic violence" as its primary framework, the specific prominence of IPV as a central theme discovered within the scholarly literature is a key focus of our analysis. Numerous studies have established strong associations between exposure to violence and elevated risks of depression, anxiety, and post-traumatic stress disorder [4-6]. In China, where traditional norms often cast family conflict as a private matter, such violence has long been underreported and undertreated [7]. The enactment of the Anti-Domestic Violence Law in 2016 marked a critical policy shift, signaling heightened legal and institutional recognition [8]. Simultaneously, international scholars and policy actors have increasingly examined how domestic violence is addressed in the Chinese context [9].

Globally, scholarly inquiry into domestic violence has produced a rich and multifaceted landscape. Systematic reviews consistently underscore the problem's severity; for instance, research focusing on South Asia—a region with one of the world's highest IPV prevalence rates—has documented its devastating physical and psychological consequences [10]. Concurrently, the scholarly focus has increasingly shifted from problem description toward the exploration of solutions, with interventions centered on women's empowerment emerging as a major global research theme [11]. This global discourse is also marked by a growing reflexivity concerning research methodology itself, as evidenced by studies during the COVID-19 pandemic that highlighted how different data collection methods significantly impact findings [12]. Against this broad scholarly backdrop, a systematic mapping of the international research landscape focused on the specific context of China is therefore both necessary and timely.

While the literature on domestic violence and women's mental health in China has expanded, existing reviews remain largely descriptive—focusing on prevalence, trends, and associated risk factors [13-15]. What remains absent is a structured, data-driven overview of how the field has evolved: thematically, institutionally, and globally. Bibliometric analysis addresses this gap by mapping research trajectories and revealing how regionally embedded issues intersect with broader scholarly discourse [16].

This study conducts a bibliometric analysis of English-language publications from Web of Science and Scopus (2000–2024) concerning domestic violence and women's mental health in China. Using visualization and co-occurrence techniques, it examines growth trends, geographic and institutional distribution, international collaboration, and thematic shifts. While a growing body of literature has explored various facets of this issue, a comprehensive, data-driven synthesis of the international English-language scholarly discourse has, to our knowledge, been absent. This study addresses this critical gap by providing the first structured map of the field's intellectual landscape, thereby widening the evidence base for health management and offering actionable insights for service managers and policymakers.

METHODS

This bibliometric analysis followed a three-stage process: data retrieval, performance analysis, and network analysis. The aim was to map the international research landscape on domestic violence and women's mental health in the Chinese context.

SEARCH STRATEGY

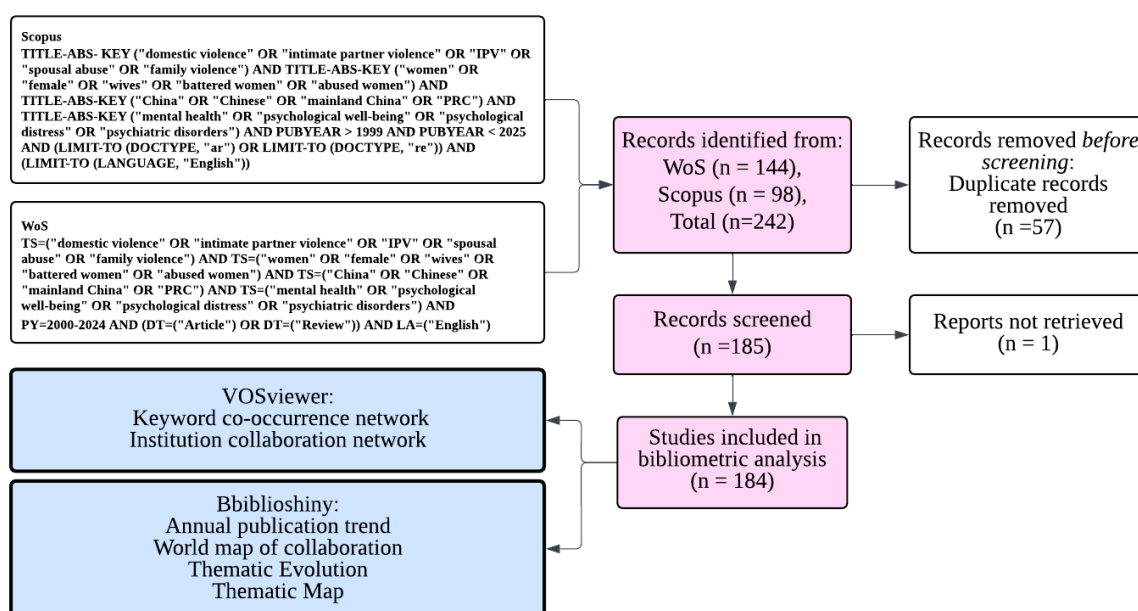
This bibliometric study was based on publications retrieved from two major citation databases—Scopus and Web of Science (WoS) - selected for their disciplinary breadth in public health, psychiatry, and the social sciences. The search was conducted on March 31, 2025, and restricted to literature published between January 2000 and December 2024. The

2000–2024 timeframe was strategically chosen to align with the establishment of comprehensive digital indexing within the core scholarly databases central to this analysis, and the launch of major global initiatives like the UN Millennium Development Goals that spurred research on gender equality and women's health, while also providing a robust period for analyzing trends surrounding China's 2016 Anti-Domestic Violence Law.

An advanced Boolean search strategy was applied across the title, abstract, and keyword fields, targeting three conceptual domains: domestic violence (e.g., “domestic violence,” “intimate partner violence,” “battered women”), mental health (e.g., “mental health,” “depression,” “anxiety”), and China (e.g., “China,” “Chinese”). Filters were embedded directly in the query to include only English-language publications and to limit document types to articles and reviews—excluding conference proceedings, book chapters, editorials, and other grey literature.

An initial pool of 242 records was retrieved (WoS = 144; Scopus = 98). Duplicate entries were identified and removed using the duplicated Matching function in the bibliometrix R package, which compares records by title, DOI, and author metadata. One record was excluded due to access restrictions, yielding a final dataset of 184 unique documents. Table 1 outlines the inclusion and exclusion criteria, and the overall data collection and analysis workflow is illustrated in Figure 1.

FIGURE 1. WORKFLOW OF DATA COLLECTION, SCREENING, AND BIBLIOMETRIC ANALYSIS



DATA PROCESSING AND BIBLIOMETRIC TOOLS

Bibliographic metadata were exported in two formats to accommodate different analytical tools. CSV files were imported into Biblioshiny - the graphical interface of the *bibliometrix* R package—for performance and conceptual structure analyses. Plain text (.txt) files were formatted for VOSviewer to map co-occurrence and collaboration networks. All files included standardized fields such as titles, authors, keywords, publication years, document types, and citation counts. As is typical in bibliometric research, the analysis was based on metadata rather than full-text content [17–18].

In Biblioshiny, we analyzed annual publication trends, international collaboration networks, thematic evolution using Sankey diagrams, and strategic thematic maps derived from the Keyword Plus field [17, 19]. In VOSviewer, keyword co-occurrence networks were generated to identify thematic clusters, and overlay visualizations highlighted temporal dynamics by color-coding keywords by average publication year. Institution-level co-authorship networks were also mapped to reveal organizational collaborations. All keyword-based analyses consistently used the Keyword Plus field across tools.

INCLUSION AND EXCLUSION CRITERIA

The inclusion and exclusion criteria applied during article screening are summarized in Table 1.

TABLE 1. INCLUSION AND EXCLUSION CRITERIA FOR ARTICLE SCREENING

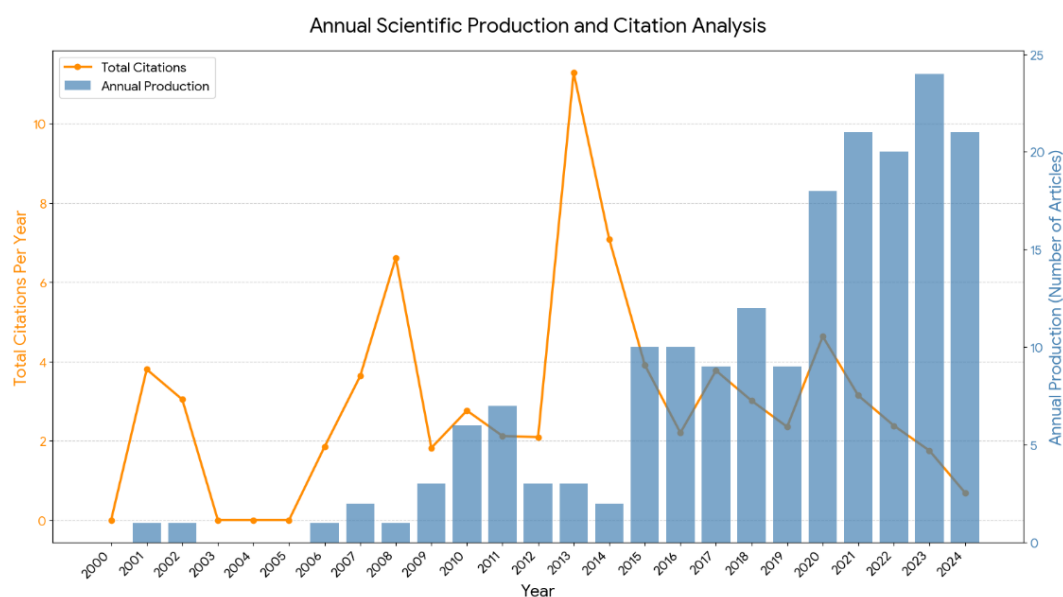
Database Criteria	Inclusion	Exclusion
Document type	Article, review	Conference papers, editorials, and book chapters, etc.
Language	English	Non-English
Timeline	2000-2024	Before 2000
Location	Worldwide	Not applicable

RESULTS

SCIENTIFIC OUTPUT AND NATIONAL CONTRIBUTIONS

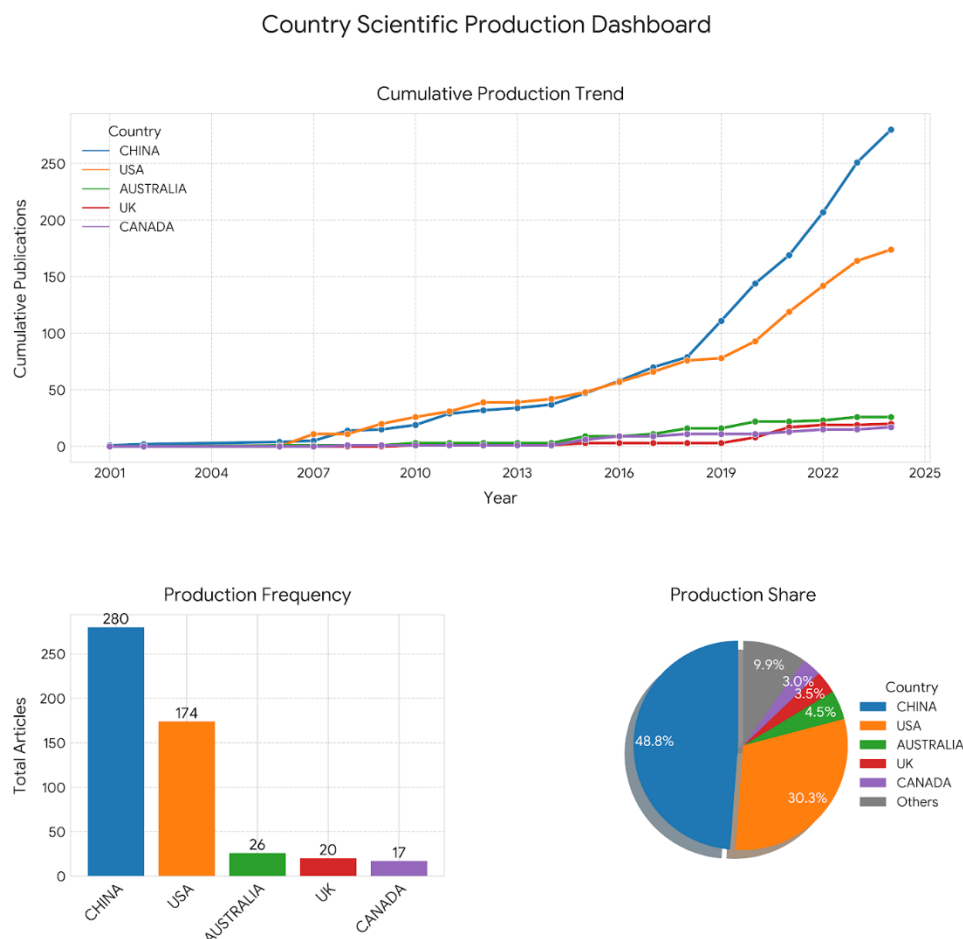
Research output on domestic violence and women's mental health in China has steadily increased over the past two decades (Figure 2). No indexed publications were retrieved for 2000. From 2001 to 2006, output remained minimal, averaging one to two articles annually. A gradual upward trend began in 2007, plateaued in 2015–2016 (10 publications each year), and accelerated thereafter—reaching 18 articles in 2020 and peaking at 24 in 2023.

FIGURE 2. ANNUAL RESEARCH OUTPUT AND CITATION ANALYSIS



In terms of citation impact, earlier publications tend to be more influential. Citation peaks in 2008 and 2013 suggest the presence of foundational studies that have attracted sustained academic attention. Recent publications are still accruing citations and may require time to establish long-term influence.

FIGURE 3. COUNTRY SCIENTIFIC PRODUCTION DASHBOARD

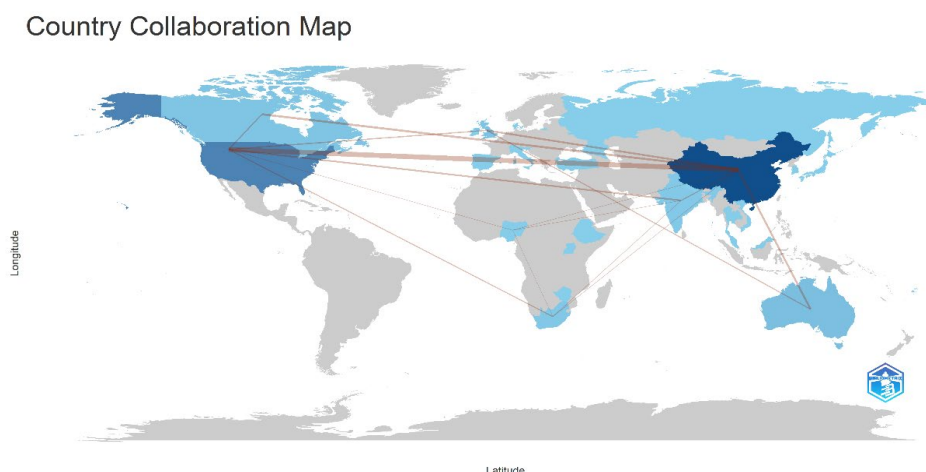


At the national level (Figure 3), China and the United States are the most prominent contributors. China leads with 280 author appearances, accounting for 48.8% of the total, followed by the United States with 174 appearances (30.3%). Other notable contributors include Australia (4.5%) and the United Kingdom (3.5%). The cumulative trend suggests that research activity from China and the U.S. has grown substantially and continues to dominate the field.

INTERNATIONAL AND INSTITUTIONAL COLLABORATION

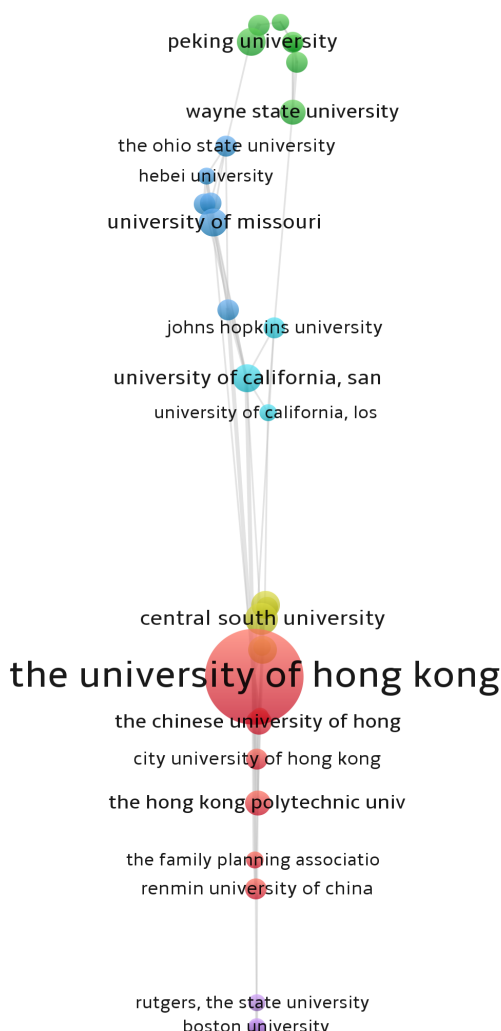
At the international level, the research landscape demonstrates a clear core-periphery collaboration structure (Figure 4). The strongest bilateral collaboration is between China and the United States, forming the central axis of the global scholarly network. These two countries also maintain partnerships with other major contributors, including Australia and the United Kingdom, creating a dual-core system that radiates outward.

FIGURE 4. COUNTRY COLLABORATION MAP



At the institutional level (Figure 5), The University of Hong Kong serves as a central hub, linking regional and international actors. It maintains strong connections with other Hong Kong institutions—such as The Chinese University of Hong Kong, City University, and Polytechnic University—as well as mainland universities like Central South University and Renmin University of China. It also collaborates with major U.S. institutions, including Johns Hopkins, Missouri, and Ohio State.

FIGURE 5. INSTITUTIONAL CO-OCCURRENCE MAP



THEMATIC STRUCTURE AND KNOWLEDGE CLUSTERS

Five thematic clusters were identified through keyword co-occurrence analysis (Figure 6, Table 2). These include: psychological impacts and epidemiology (Cluster 1), perinatal mental health and social support (Cluster 2), high-risk and marginalized populations (Cluster 3), stress-related predictors of abuse (Cluster 4), and intervention strategies for pregnancy-related violence (Cluster 5). Together, they reflect a multifaceted knowledge structure linking symptomology, population needs, and applied responses.

FIGURE 6. KEYWORD CO-OCCURRENCE NETWORK BASED ON CLUSTERED THEMATIC SIMILARITY

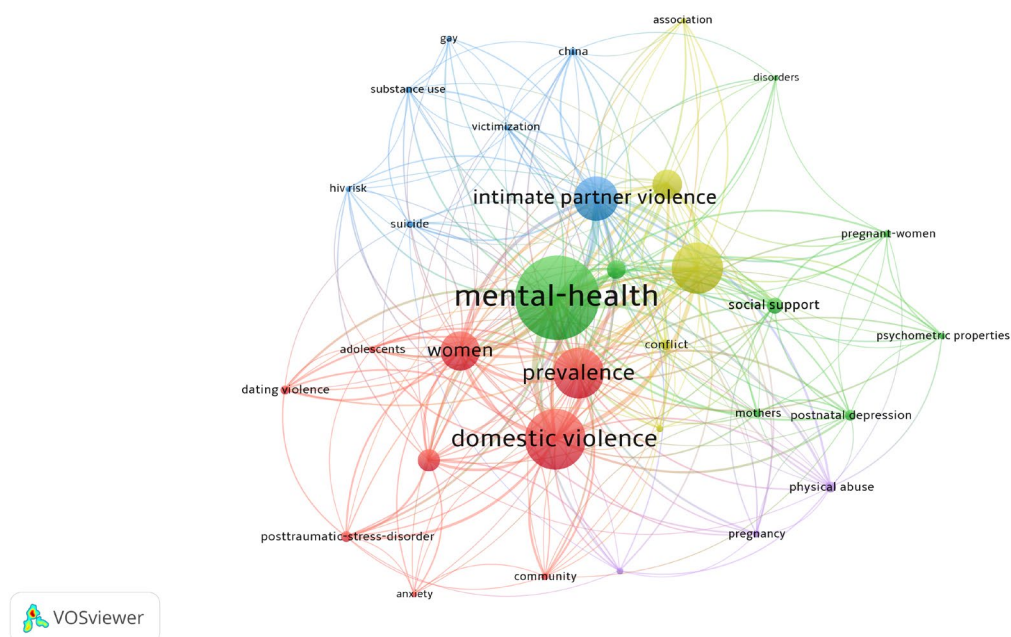


TABLE 2. THEMATIC CLUSTERS DERIVED FROM KEYWORD CO-OCCURRENCE ANALYSIS AND INTERPRETATION

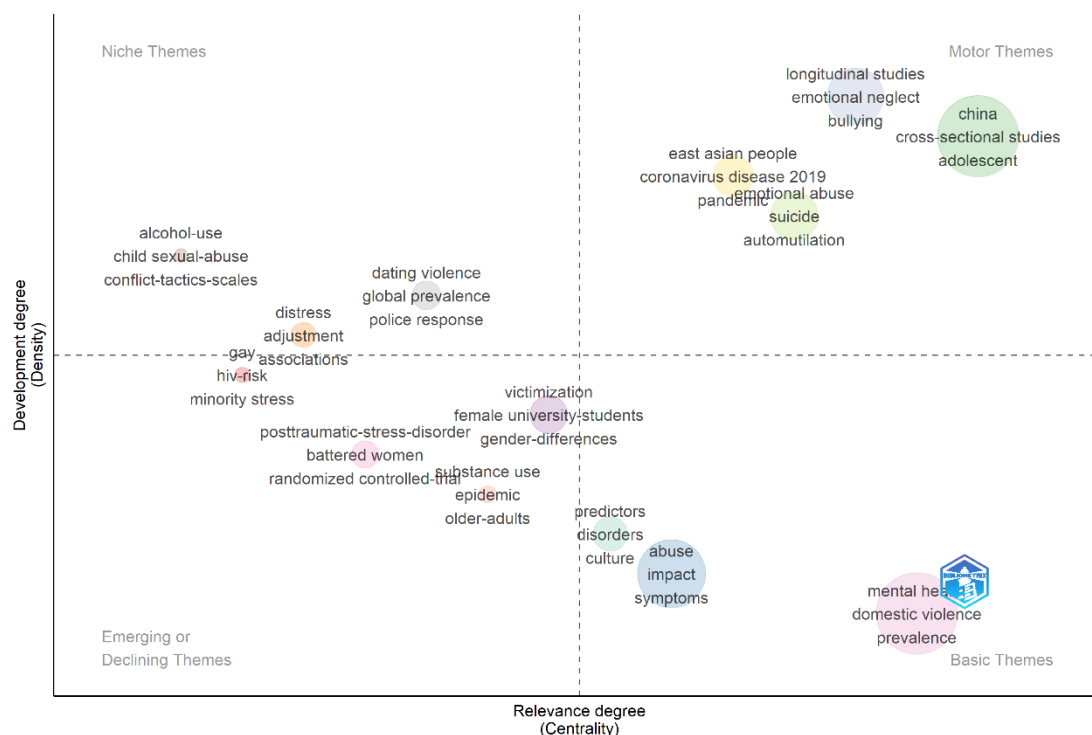
Cluster	Thematic Label	Keywords	Description
1	Psychological Consequences and Epidemiology of DV	domestic violence, adolescents, women, depression, anxiety, PTSD, prevalence	Focuses on the mental health consequences of domestic violence among young women, adopting an epidemiological lens on depression, anxiety, and posttraumatic stress disorder (PTSD).
2	Perinatal Mental Health and Social Support	pregnant women, mothers, postnatal depression, social support, psychometric properties	Explores women's mental health during the perinatal period, emphasizing social support and validating population-specific assessment tools.
3	IPV among High-Risk and Marginalized Populations	intimate partner violence, substance use, HIV risk, suicide, gay	Addresses intersections of IPV with substance use, HIV risk, suicidality, and sexual minority stress.
4	Risk Factors and Stress Frameworks of Abuse	risk factor, stress, conflict, association, abuse	Investigates predictors and correlates of domestic violence through stress-based theoretical models.
5	Targeted Interventions for Abuse during Pregnancy	advocacy intervention, physical abuse, pregnancy	Highlights advocacy-based strategies aimed at protecting pregnant women from physical abuse.

Together, these clusters reflect a multifaceted knowledge structure linking epidemiological patterns, psychological processes, and intervention strategies in research on domestic violence and women's mental health in China.

STRATEGIC THEMATIC MAP

A strategic thematic map was constructed using co-word analysis to evaluate the developmental stage and structural relevance of key research themes (Figure 7). This two-dimensional plot positions themes by centrality (interconnectedness) and density (internal cohesion), forming four quadrants that reflect varying degrees of thematic maturity and integration.

FIGURE 7. STRATEGIC THEMATIC MAP



The upper right quadrant contains motor themes—well-developed and structurally integrated. Terms such as “China,” “adolescent,” “cross-sectional studies,” “longitudinal studies,” and “bullying” suggest that youth mental health and population-level assessment form an empirically active domain.

The lower right quadrant features basic themes including “mental health,” “domestic violence,” “prevalence,” “depression,” and “psychological distress.” These function as conceptual anchors, broadly connected but less internally differentiated.

In the upper left quadrant, niche themes such as “alcohol use,” “child sexual abuse,” “substance misuse,” “conflict tactics scales,” and “intimate partner violence” indicate focused but less integrated areas of research.

The lower left quadrant presents emerging or declining themes with limited connectivity and development, including “posttraumatic stress disorder,” “battered women,” “randomized controlled trial,” and “psychopathology.” While currently peripheral, these may signal underexplored or future growth areas.

Overall, the map shows a stable foundation of mental health research, with growing thematic momentum in adolescent-focused studies and methodological innovation.

THEMATIC EVOLUTION AND EMERGING TRENDS

To examine how research themes evolved over time, we divided the timeline into two phases—2001–2015 and 2016–2024—using the enactment of China’s Anti-Domestic Violence Law as a key inflection point. Keyword overlay visualization (Figure 8) and a Sankey diagram (Figure 9) reveal a transition from broad conceptual inquiry to more targeted, intervention-oriented themes.

FIGURE 8. TEMPORAL OVERLAY VISUALIZATION OF KEYWORD CO-OCCURRENCE

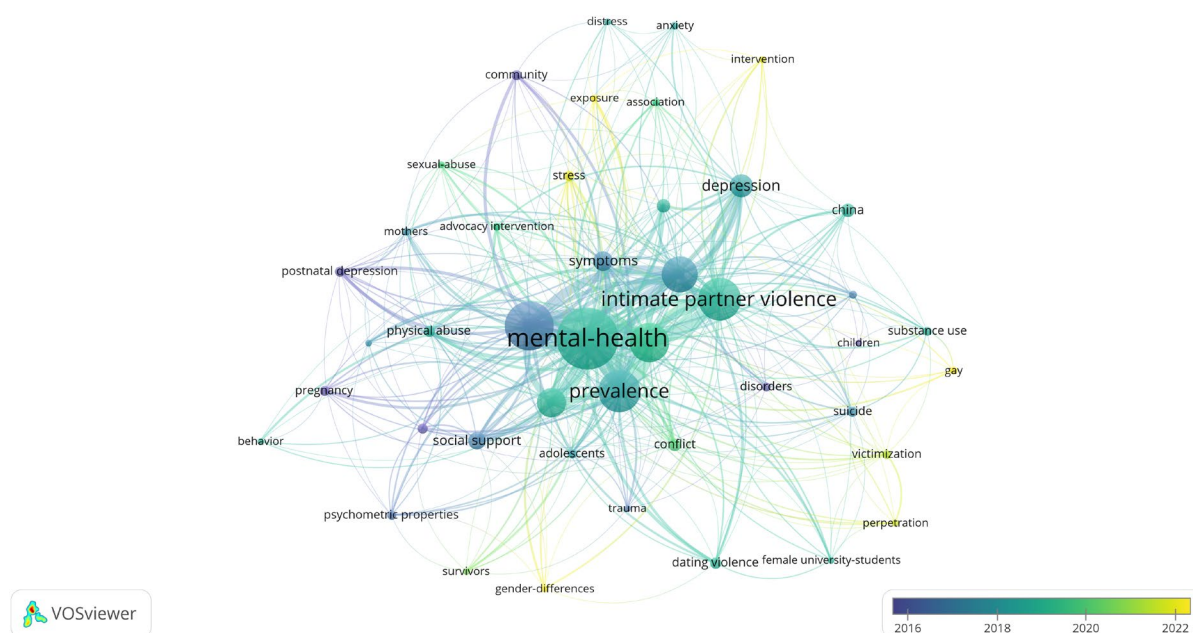
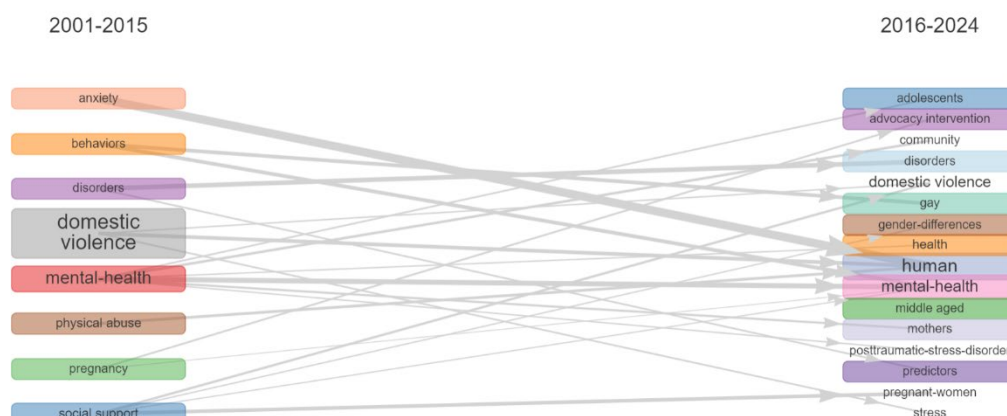


FIGURE 9. THEMATIC EVOLUTION OF KEYWORDS OVER TIME VISUALIZED THROUGH A SANKEY DIAGRAM



In the earlier period, dominant keywords included “domestic violence,” “mental health,” “anxiety,” “behaviors,” and “social support,” reflecting foundational concerns. These appear in cooler tones on the overlay map and on the left side of the Sankey diagram.

Since 2016, the thematic focus has become more differentiated and applied. While core concepts persist, newer terms such as “adolescents,” “advocacy intervention,” “posttraumatic stress disorder,” and “gender differences” highlight growing attention to trauma recovery, population-specific needs, and intervention design. These developments reflect growing research attention to how domestic violence impacts women across life stages, with particular concern for adolescents and the intergenerational transmission of trauma.

Overall, the evolution reflects a shift from documenting psychological outcomes to investigating causal mechanisms, risk factors, and evidence-based responses.

DISCUSSION

This study offers the first bibliometric mapping of international research on domestic violence and women's mental health in the Chinese context. By integrating analyses of publication output, collaboration networks, and thematic evolution, it illustrates how a locally embedded issue has entered global academic discourse.

POLICY RESONANCE AND SCHOLARLY GROWTH

A defining inflection point was the implementation of China's Anti-Domestic Violence Law in 2016[8], which catalyzed academic engagement by conferring institutional legitimacy on a once-private issue. Scholarly focus expanded from prevalence surveys to structural determinants and intervention design, signaling the law's role as both policy milestone and research trigger.

COLLABORATION STRUCTURES AND KNOWLEDGE EXCHANGE

The field exhibits a dual-core collaboration structure, with China and the U.S. as central contributors and Hong Kong—especially The University of Hong Kong—acting as a critical bridge. This network facilitates theoretical and methodological exchange, supporting the contextual adaptation of trauma-informed models to Chinese sociocultural systems.

THEMATIC EVOLUTION: FROM DESCRIPTION TO APPLICATION

Thematic analysis reveals a shift from broad descriptors (e.g., depression, anxiety, prevalence) to targeted themes such as PTSD, advocacy interventions, and gender differences. The rise of "adolescents" reflects growing attention to intergenerational trauma and developmental timing. Meanwhile, PTSD's prominence suggests a refinement of psychological constructs in research discourse.

Peripheral yet conceptually vital themes—including child sexual abuse, substance misuse, and HIV risk—underscore long-term psychological consequences and risk clustering. Early trauma exposure has been linked to adult victimization, often mediated through substance use and risky behaviors [20-23], necessitating integrated prevention strategies.

Cross-sectional designs still dominate, but the emergence of randomized controlled trials (RCTs) points to a methodological shift toward causal inference and intervention evaluation. This thematic shift towards "intervention" within the China-focused literature mirrors a diverse and evolving global landscape of solutions. International systematic reviews indicate that this landscape is multi-faceted, encompassing socio-economic empowerment models that combine financial independence with community support [11]; formal psychosocial interventions aimed at reducing survivors' symptoms of depression and PTSD [24]; and community-based participatory approaches that utilize group sessions to address safety and mental health needs [25]. This multi-dimensional global context provides a crucial benchmark for future analysis of the specific intervention types gaining prominence in the Chinese context and their cultural adaptability.

IMPLICATIONS FOR RESEARCH AND POLICY

Building on this study's findings, future inquiry could be guided by several specific research questions. First, building directly on our finding that "intervention" is a prominent emerging theme, future studies should investigate what specific types of empowerment-based models are being applied in the Chinese context and how these global models are being culturally adapted [11]. Second, to add nuance to this intervention-focused agenda, future research could explore the extent to which the China-focused literature differentiates between improving mental health outcomes and reducing violence recurrence—a critical distinction highlighted in global meta-analyses [24]. Finally, moving beyond the structural mapping of collaboration networks, a crucial next step is to qualitatively examine the nature of these international partnerships and the degree to which they incorporate community-based participatory principles in their research process [25].

STRENGTHS AND LIMITATIONS

This study's strength lies in its integrative design, combining data from WoS and Scopus and applying validated tools. Limitations include the exclusion of Chinese-language publications, the descriptive nature of bibliometric methods, and citation lag for recent work. Nonetheless, the findings highlight critical gaps in trauma services, intersectoral collaboration, and culturally tailored mental health responses—offering actionable insights for service planning and system design.

CONCLUSION

This study provides the first comprehensive bibliometric overview of the international, English-language research on domestic violence and women's mental health in the Chinese context. Our findings reveal a field of rapidly expanding scholarly engagement, particularly after 2016 legal reforms, with a clear thematic evolution from descriptive work towards intervention-focused and trauma-informed models. This maturation of the research agenda presents both an opportunity and a challenge for health management.

Crucially, for health service managers and policymakers, this study does more than just summarize research; it provides a strategic map. It identifies key intellectual themes (e.g., empowerment models, psychosocial support), influential collaborative networks, and persistent research gaps. This map serves as a vital evidence base to inform the strategic planning, cross-sectoral integration, and cultural adaptation of mental health services designed to address the profound psychological consequences of domestic violence.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

All data used in this study were retrieved in March 2025 from publicly accessible academic databases, including Web of Science (<https://www.webofscience.com/>) and Scopus (<https://www.scopus.com/>). All key results are presented in the manuscript through tables and figures. Supporting materials (e.g., cleaned CSV files and analysis scripts) are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

This study did not involve human participants, animals, or the collection of primary data. Therefore, ethical approval was not required.

ACKNOWLEDGEMENTS

The authors would like to thank the experts who provided recommendations on analytic tools and resources.

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NURSES IN NEED OF PROTECTION: STRATEGIES FOR REDUCING WORKPLACE VIOLENCE AGAINST NURSES - A POLICY BRIEF

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ABSTRACT

Workplace violence is a major occupational hazard that disproportionately affects nurses due to their direct and prolonged interactions with patients and their families. This policy brief, developed through a comprehensive review of global literature and policy documents, argues that existing frameworks are insufficient to address the root causes of this violence.

This analysis reveals a critical disconnect between policy and practice, stemming from inadequate legal enforcement, persistent staffing shortages, and a lack of specific, context-aware interventions. This brief outlines evidence-based strategies to mitigate violence and enhance nurse safety. It proposes a prioritized set of recommendations, including implementing effective incident reporting and post-incident support systems and providing context-specific de-escalation training, as well as long-term structural reforms focused on addressing chronic nursing shortages, fostering a culture of safety and security presence in healthcare settings.

By adopting these measures, policymakers, healthcare managers, and professional organizations can create a safer, more supportive environment for nurses, ultimately improving patient care and strengthening the entire healthcare system.

KEYWORDS

nurse, patient, workplace violence, policy brief

INTRODUCTION

Workplace violence has emerged as a significant challenge within healthcare systems and has been identified as a critical health priority by the World Health Organization [1]. Workplace violence encompasses any act or threat of physical violence, harassment, intimidation, or other disruptive and threatening behaviors intended to inflict harm upon or abuse employees. While violence occurs in various occupational settings, nurses are more exposed to workplace violence, particularly from patients and their families [2]. Given their long interactions with patients and their families, particularly during critical incidents such as severe injuries, failed resuscitations, and patient deaths, they are more susceptible to mistreatment and aggression from various individuals within the healthcare system [3, 4].

According to the International Council of Nurses, healthcare workers, particularly nurses, are at a higher risk of experiencing violence compared to prison guards and police officers [5, 6]. Recent data shows that healthcare workers account for nearly 75% of all nonfatal workplace assaults worldwide, with nurses being five times more likely to suffer a workplace violence-related injury than other workers overall. Furthermore, according to a 2023 survey by National Nurses United, 8 in 10 nurses have experienced at least one type of workplace violence in the past year, with nearly half reporting an increase in violent incidents on their unit [2, 5, 7]. In the United States, a 2024 meta-analysis showed a 43% pooled prevalence of violence against nurses between 2020 and 2022 alone [8].

The nature and causes of this violence often differ by context [9]. While violence is a major issue in high-income countries, it is also a significant problem in low- and middle-income countries (LMICs), where it is often linked to weak healthcare systems and a lack of resources. For example, studies in some African countries show prevalence rates ranging from 19% to 67% [10]. The context of rural versus urban settings also presents distinct challenges. In urban environments, particularly in large emergency departments, nurses may experience higher rates of physical assault and serious threats [11, 12]. In contrast, nurses in rural settings may face more frequent verbal aggression and often lack on-site security, having to rely solely on local law enforcement [13].

Nurses who encounter workplace violence frequently experience a range of emotional, behavioral and physical consequences, including depression, anxiety, fear, family disputes, decreased professional satisfaction, internalized anger, job dissatisfaction, and job turnover [4, 14]. Many of these consequences ultimately affect patients as a core target of healthcare system. The ramifications of job turnover and nursing shortages can result in suboptimal or poor-quality patient care, with far-reaching implications [15].

Providing high-quality patient care necessitates a supportive environment that enables nurses to fully utilize their knowledge and skills. It is essential to recognize that nurses, as caregivers, also require care. Given these considerations, this policy brief will delineate recommendations aimed at mitigating workplace violence and enhancing safety for nurses. Given these considerations, the purpose of this policy brief is to analyze the challenges of workplace violence and propose a series of evidence-based recommendations to mitigate this problem and enhance safety for nurses.

METHOD

This literature and policy review was conducted over a defined search period from January 1, 2015, to August 31, 2025, ensuring all contemporary policy shifts and post-pandemic evidence were captured. Systematic searches were performed across four core electronic databases: MEDLINE (via PubMed), CINAHL, Scopus and Web of Science. The search strategy utilized a robust combination of keywords and subject headings ("Nurse," "Workplace Violence," "Occupational Aggression," and "Policy") to maximize document retrieval. Our Inclusion/Exclusion Criteria were highly specific to guarantee the relevance and focus of the brief: we included only peer-reviewed original research, systematic reviews, and official policy documents (national and international) published in English that explicitly focused on violence directed toward nursing staff. We strictly excluded all editorials, commentaries, conference abstracts, or studies where data was not disaggregated to specifically report on nurses. Furthermore, to guarantee research reliance, every selected empirical study underwent formal Quality Assessment using the validated Joanna Briggs Institute (JBI) Critical Appraisal Tools appropriate for the study design. Only studies meeting a pre-defined minimum quality threshold (indicating a low risk of bias) were retained for the final policy synthesis, ensuring our recommendations are founded on the highest quality evidence.

CURRENT POLICIES AND ANALYSIS OF IMPLEMENTATION

Current policies addressing workplace violence show significant variation across countries and healthcare organizations. Despite these differences, common strategies are implemented by numerous healthcare systems. This policy brief adopts a global perspective, analyzing common strategies implemented across different legal and cultural contexts to provide key aspects of current policies for workplace violence:

1. **Universal Declaration of Human Rights:** This declaration emphasizes the right of all individuals to a safe and healthy work environment. It stipulates that all personnel have the right to work in an environment that is physically and psychologically safe. Employers are obligated to implement measures to ensure such an environment. Individuals who experience workplace violence have right to file a complaint, and any damages incurred must be compensated [16, 17].
2. **International Labor Organization Convention 190:** This convention addresses the issue of violence and harassment in the workplace. It provides definitions, principles, and fundamental rights for workers to address this phenomenon. Complementing Convention 190, Recommendation No. 206 offers guidance to governments, employers, and workers on preventing and addressing violence and harassment in the workplace [18, 19].
3. **Islamic Penal Code:** Under this legislation, any individual, including patients and their relatives, who engages in verbal or physical abuse towards healthcare personnel during the execution of their duties is subject to imprisonment for three to six months, up to 74 lashes, and a monetary fine. The use of profane language, insults, humiliation, verbal abuse, and any physical actions (such as striking) that are deemed insulting or humiliating falls within this category [20].
4. **Criminalization of Violence Against Healthcare Workers:** Countries like Iran, France and Albania have enacted legislation that criminalizes violence against healthcare workers by imposing severe penalties on offenders. These penalties may include fines, imprisonment, mandatory community service in a healthcare setting, compensation for damages, and criminal records, which can have long-lasting adverse consequences for the perpetrator [21, 22].
5. **Occupational Health and Safety (OHS) Legislative Mandates:** This approach places a legally binding duty of care on employers to proactively manage violence as a psychosocial hazard. This is a central strategy in many Anglophone countries. For example, in Australia and New Zealand, the Model WHS Laws and the Health and Safety at Work Act 2015, respectively, require healthcare employers to conduct mandatory risk assessments and implement preventative measures to eliminate or minimize the risk of violence against nurses and other personnel [23, 24].

It is imperative to note that the enforcement and efficacy of these laws are significantly influenced by regional policies and vary by country. Below is a comparison of the actions taken by different countries to prevent workplace violence against nurses:

UNITED STATES, CANADA, AND EUROPEAN COUNTRIES

These nations mostly focus on strong legal and organizational frameworks.

- **United States:** Some states, like North Carolina, have passed laws requiring the presence of law enforcement officers in emergency departments. The Occupational Safety and Health Administration (OSHA) has also issued guidelines to protect healthcare workers from violence [25].
- **Canada:** Provincial and federal laws require employers to assess the risks of violence and implement prevention programs [26].
- **United Kingdom:** The United Kingdom addresses this issue through a combination of statutory obligations and its Common Law foundation. The primary legislation is the Health and Safety at Work Act 1974, which places a broad, overarching duty on all employers, including the National Health Service (NHS), to protect staff from foreseeable harm, explicitly covering violence and aggression. Furthermore, the Common Law Duty of Care reinforces this by allowing for civil liability if employers fail to take reasonable preventive measures informed by mandatory risk assessments [27].
- **European Union:** Social partner agreements between employers and trade unions condemn workplace violence and harassment, and they encourage member states to pass binding national laws [28].

ASIAN COUNTRIES

The measures taken in many Asian countries are often focused on training and cultural change.

- **Japan:** To combat violence, hospitals have implemented measures such as installing cameras and providing staff training [29].
- **Iran:** Efforts to address violence against nurses have focused on strengthening legal protections, promoting public awareness, and providing communication skills training for staff [30].

OCEANIA COUNTRIES

- **Australia:** The Australian legal framework is primarily defined by the Model Work Health and Safety (WHS) Laws adopted across its states and territories. This legislation imposes a non-negotiable Duty of Care on all employers, known as Persons Conducting a Business or Undertaking (PCBUs)—including hospitals and healthcare facilities. They are legally required to manage violence and aggression as a significant psychosocial hazard [31].
- **New Zealand:** New Zealand's legal approach is governed by the Health and Safety at Work Act 2015 (HSWA), which is enforced by WorkSafe NZ. Similar to Australia, the HSWA establishes a Primary Duty of Care requiring PCBUs to ensure the health and safety of their staff [23].

AFRICAN COUNTRIES

In African countries, preventative actions often take the form of management and educational interventions. Some nations, like South Africa, are working to improve laws and provide training for nurses. Programs have been implemented to include assessing patient risk upon admission, using empathetic communication with patients and their companions, and training hospital security personnel to manage high-risk situations [10].

Current policies on workplace violence show significant variation, but a critical analysis reveals common limitations in their implementation. While international conventions and national laws provide a legal foundation, they often fail to drive meaningful change. Here are limitations of current policies:

Descriptive, Not Enforceable: Instruments like the Universal Declaration of Human Rights and the International Labor Organization Convention 190 offer vital principles but are not always translated into specific, enforceable national laws. This leaves their application to the discretion of governments and healthcare organizations, leading to inconsistent protection for nurses.

Focus on Punishment, Not Prevention: While some countries, such as those with legislation based on the Islamic Penal Code, have criminalized violence against healthcare workers, the effectiveness of these laws is often limited. Their emphasis on punishment over proactive prevention fails to address the underlying causes of violence, such as mental health issues, patient frustration, or systemic failures.

Inconsistent Application: Even in high-income countries with robust frameworks, such as the U.S. and Canada, studies show a significant gap between policy and practice. Despite laws requiring employers to assess risk, incidents remain vastly underreported due to a culture of acceptance ("violence is part of the job"), fear of reprisal, and complex, cumbersome reporting systems. In Canada, for example, nurses report high rates of violence despite the existence of provincial laws requiring prevention programs [16].

Weak Governance and Leadership: A lack of decisive leadership from hospital management and government bodies prevents the allocation of sufficient funding and the establishment of a zero-tolerance culture. Without top-down commitment, policies become mere words on a page.

Organizational Culture: A prevalent culture that discourages reporting and normalizes violence as part of the job is a major barrier. Nurses often believe that reporting an incident is futile, leading to an insidious cycle of underreporting that masks the true scale of the problem [23].

Insufficient Funding: Many policies are not backed by dedicated financial resources. This prevents hospitals from implementing essential security infrastructure, robust training programs, and comprehensive psychosocial support for their staff [32-34].

POLICY IMPLICATIONS AND RECOMMENDATION

To address these challenges, a strategic prioritization of recommendations is essential. The following recommendations are prioritized by their potential for low-cost/high-impact versus long-term structural reforms, offering a clear roadmap for action across diverse national contexts. It is acknowledged that many high-income nations, such as Australia, have already successfully implemented numerous Priority 1 (Low-Cost / High-Impact) interventions; for these countries, the critical focus shifts immediately to the more complex Priority 2 and 3 structural and legislative reforms. Conversely, this roadmap allows resource-limited systems to focus on achieving immediate safety gains with minimal investment.

PRIORITY 1: LOW-COST / HIGH-IMPACT INTERVENTIONS

These are immediate, actionable steps that can be implemented quickly and provide immediate safety benefits.

Implement effective incident reporting and post-incident support systems: Hospitals should immediately adopt a confidential, simple-to-use reporting system that guarantees non-retaliation. Following an incident, nurses should be provided with immediate, on-site psychosocial support. This support is critical for mitigating the psychological trauma that can lead to burnout and turnover [35].

Provide context-specific de-escalation training: All staff, particularly those in high-risk areas, should receive mandatory de-escalation training tailored to their specific patient population. A study by Alkorashy HAE and et al. demonstrated that targeted crisis management training can effectively reduce violence and improve nurses' coping abilities [36]. In some cases, nurses expressed a desire for training in dealing with verbal aggression from colleagues. Conducting training sessions for nurses and other hospital staff to enhance problem-solving and crisis management skills can help reduce tension and improve management of stressful situations. Additionally, if nurses are aware of their rights and responsibilities during such incidents, they can approach the management of these challenges with greater confidence (29).

PRIORITY 2: MEDIUM-TERM REFORMS

These strategies require a more coordinated effort and funding but can lead to significant, lasting change across healthcare systems.

Strengthen legal frameworks with a focus on enforcement: Policymakers should pass legislation that specifically criminalizes violence against nurses, ensuring that the law covers both physical and verbal abuse. Critically, these laws must be backed by dedicated funding for legal aid and specialized prosecutorial units to ensure consistent enforcement, which is a key weakness of current policies [25].

Launch national public awareness campaigns: Policymakers should fund campaigns that use social and traditional media to educate the public [10, 25]. Media have become powerful tool for disseminating information and educating the public [37]. Creating programs that address workplace violence in healthcare settings, highlighting the harm experienced by nurses and patients and the legal consequences for perpetrators can foster a culture of awareness and prevention [38]. By receiving these messages through media and social networks, individuals are better equipped to make informed decisions when faced with similar situations. Sharing the challenges nurses face in their work environments, clarifies that they are not responsible for all outcomes experienced by patients and highlighting the reality of nursing shortages in many healthcare settings, the public can develop a more accurate and empathetic understanding of the profession. Consequently, individuals are more likely to interact with nurses in a respectful and supportive manner [39].

Schools can also foster this culture of respect. By educating students about the importance of respecting healthcare workers from a young age through various methods such as plays, involving students whose parents are healthcare professionals, and having these parents give speech to students, we can instill a deep-rooted appreciation for nurses, doctors, and other medical staff. This can contribute to positive behavioral changes within society in the future [40, 41].

PRIORITY 3: LONG-TERM STRUCTURAL REFORMS

These are fundamental changes that require significant political will and a sustained effort to address the root causes of violence.

Address chronic nursing shortages: The most significant long-term solution is to resolve chronic staff shortages. There is a direct correlation between high patient loads, workload factors (like unfinished tasks due to understaffing), and an increase in emotional and physical abuse [14, 15]. This finding, echoed in numerous other studies, establishes a clear link between chronic staffing shortages and the rise in violent incidents [9, 15, 42]. Policymakers must invest in nursing education, offer tuition forgiveness programs, and enact legislation that mandates safe nurse-to-patient ratios. Studies have consistently shown a direct correlation between high patient loads and increased violence, as patient dissatisfaction with delayed care is a primary trigger [9, 42].

Foster a culture of safety: Hospital management, in partnership with professional organizations, must work to fundamentally change the organizational culture. This involves creating a safe space where nurses are encouraged, not punished, for reporting incidents. This top-down change is essential to ensuring that all other interventions are effective [43, 44].

Security presence in healthcare settings: In certain social environments, influenced by specific cultural factors, levels of violence may be higher than those in other societies. This can contribute to an increased risk of violence in health care settings. Beyond acting as a deterrent against disturbances caused by patients or their families, security personnel can provide support and reassurance to nurses [45, 46]. Identifying high-risk areas within hospitals, such as intensive care units, emergency departments and burns units can enable proactive measures and improve the likelihood of successful crisis management. Implementing warning systems for patients and their families who are at a higher risk of violent behavior, as well as screening individuals seeking healthcare services with a history of violence, can also be effective strategies [18, 45].

CONCLUSION

Workplace violence against nurses is a complex and pressing issue in the health care system. Ignoring this problem can lead to a decline in quality of care, increased nurse dissatisfaction and turnover and ultimately a weakened healthcare system. The COVID-19 pandemic has highlighted the critical role nurses play in preserving public health, indicates the need to address the challenges they face in their work environments. This policy brief proposed several strategies to mitigate workplace violence, including ensuring adequate staffing and improving hospital infrastructure, providing crisis management training, increasing security presence in healthcare settings, and promoting public awareness and education.

ETHICAL CONSIDERATION

All data used in this manuscript is in accordance with National Health and Medical Research Council ethical standards.

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