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CONFERENCE ARTICLES – ACHSM ASIA-PACIFIC HEALTH LEADERSHIP CONGRESS, 2025**Challenges in Change Management for AI-Driven Prediction Tools in Public Hospital Clinical Wards: The Case of mROC Implementation - ACHSM Asia-Pacific Health Leadership Congress in Darwin 2025**

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CHALLENGES IN CHANGE MANAGEMENT FOR AI-DRIVEN PREDICTION TOOLS IN PUBLIC HOSPITAL CLINICAL WARDS: THE CASE OF MROC IMPLEMENTATION

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ABSTRACT

The integration of artificial intelligence (AI) in healthcare offers significant opportunities to enhance clinical decision-making and patient outcomes. However, AI adoption in public hospital settings presents various challenges, particularly concerning clinician resistance, concerns over predictive accuracy, and the perceived threat to traditional clinical judgment. This study examines the implementation of the Modelling Risks and Outcome Calculations (mROC) tool, an AI-driven predictive system developed to reduce hospital-acquired complications (HACs) at North Metropolitan Health Service (NMHS).

The mROC pilot demonstrated notable success, particularly in reducing urinary tract infections (UTIs) within a neurosurgery ward, achieving a 48% reduction in UTI rates per 1,000 bed days and an estimated cost savings of \$AUD406,758 over three months. Despite these promising results, significant barriers hindered broader implementation. Resistance stemmed from the disruption of established clinical workflows, scepticism regarding AI-driven predictions, and concerns about increased scrutiny over clinical decision-making.

Furthermore, disparities between mROC risk assessments and traditional clinical assessments generated uncertainty about the tool's reliability. Limited clinician engagement in the tool's development also contributed to reluctance in its adoption, emphasising the importance of co-design in AI integration.

This paper identifies key lessons from the mROC implementation, highlighting the necessity of early clinician involvement, transparent communication of AI effectiveness, and strategies for aligning AI tools with clinical workflows. Recommendations include structured change management approaches, iterative pilot trials, and improved real-time adaptability of AI models to evolving patient conditions. By addressing these challenges, AI-driven tools like mROC can foster sustainable adoption, optimising patient care while supporting clinical decision-making in public hospital settings.

KEYWORDS

artificial intelligence (AI), Change Management, Public Hospital

INTRODUCTION

The integration of artificial intelligence (AI) in healthcare has the ability to transform clinical decision-making by offering predictive tools that improve patient outcomes and operational efficiency. However, despite its potential, the implementation of AI-based solutions in public hospital settings faces considerable challenges, particularly due to human factors such as resistance to change, fear of job displacement, and concerns about accountability.

This paper explores the implementation of the mROC tool, an evidence-based AI-driven predictive system designed to improve patient safety by identifying individuals at high risk of hospital-acquired complications (HACs). The study evaluates the reluctance of healthcare professionals to adopt AI-driven assessments, examines concerns about its predictive accuracy, and compares mROC to traditional risk assessment models used for falls and infection prevention.

IDENTIFIED PROBLEMS

Hospital-acquired complications (HACs) such as falls, UTIs, pressure injuries, and aspiration pneumonia significantly impact patient outcomes and hospital resource allocation. These conditions are not only detrimental to patient health but also result in increased lengths of stay, higher morbidity, and financial strain on healthcare systems. At NMHS, data showed that patients with HACs had hospital stays six times longer than those without, with total costs amounting to \$AUD49.4 million in the 2022/23 financial year and \$AUD1.5 million in penalties for safety performance shortfalls.

In response to this critical issue, NMHS developed the mROC tool to provide real-time, patient-specific risk assessments using AI and data science methods. The system applies logistic regression models to clinical and demographic data to identify high-risk patients early in their care trajectory.

PROJECT OBJECTIVES AND APPROACH

The mROC initiative aimed to shift risk assessment from a generalized, population-level model to an individualized approach that prioritizes high-risk patients for proactive intervention. Key objectives included:

- Enhancing patient safety by supporting early, targeted clinical interventions.
- Reducing the incidence and severity of HACs through predictive analytics.
- Demonstrating cost-effectiveness and improving healthcare delivery efficiency.
- Engaging clinicians in a co-design process to align the tool with existing workflows.

A three-month pilot was conducted in a Neurosurgery ward, where the tool identified high-risk UTI patients using predictive markers. Interventions included educational posters, patient leaflets, and bedside visual cues. The results were compelling:

- 48% decrease in UTIs per 1,000 bed days.
- 55% absolute reduction in total UTI HACs.
- \$AUD406,758 in direct cost savings.
- Projected \$AUD10.5 million in annual savings if scaled system-wide.

Encouraged by these findings, NMHS expanded the mROC initiative to additional wards and clinical contexts.

CHALLENGES IN IMPLEMENTATION

Despite early success, scaling mROC across the organization revealed several critical challenges that limited its broader adoption [1]. These were categorised into four core areas:

CLINICAL ADOPTION AND WORKFLOW DISRUPTION

The transition to AI-supported care required significant behavioral and procedural adjustments. Clinicians had to incorporate mROC insights without additional staffing or system-level workflow restructuring. This integration gap caused friction, especially when mROC predictions conflicted with existing evidence-based tools such as traditional falls risk assessments.

The result was skepticism about whether the tool truly added value, especially when it labeled most patients as low-risk, in contrast to conventional protocols that assumed higher default risk levels. This disconnect created doubts about reliability and fueled resistance among staff.

RESISTANCE ROOTED IN HUMAN FACTORS

Healthcare professionals expressed strong concerns over the implications of AI integration. A major theme was fear that AI would reduce professional autonomy and shift accountability from collective clinical judgment to individual performance metrics. Nurses, in particular, feared mROC could be used to evaluate their effectiveness unfairly if predictive outcomes didn't align with clinical actions or patient results [2].

This mistrust was exacerbated by a lack of familiarity with AI technologies, underscoring a digital capability gap within the workforce. Many staff felt unprepared to interpret or contextualize the tool's recommendations, contributing to disengagement.

TECHNICAL LIMITATIONS IN PREDICTION

While the model's logic was statistically sound, it occasionally failed to capture real-time shifts in patient risk. The absence of a comprehensive electronic medical record (EMR) system limited the model's responsiveness. For instance, a patient classified as low-risk upon admission might experience a deterioration in condition that the tool would not detect due to reliance on static, administrative data inputs.

Clinicians also noted that mROC occasionally underestimated risk levels for medium-high acuity patients while overestimating for those with lower risk, further undermining trust in its outputs.

LACK OF STAKEHOLDER ENGAGEMENT AND COMMUNICATION

Another major barrier was the perception that mROC was imposed on clinical teams without sufficient engagement. Many clinicians were unaware of its success in early trials due to limited communication about its impact, and felt excluded from decision-making processes. This led to skepticism, lack of ownership, and resistance to integration.

Moreover, stakeholders were unclear about how mROC would fit into the broader model of care, and who would be accountable for outcomes related to AI-generated predictions. Without a clear service delivery model, clinicians viewed the tool more as an administrative task than a clinical support system.

RESULTS AND FINDINGS

IMPACT OF RESISTANCE ON IMPLEMENTATION

Despite demonstrating success in preventing urinary tract infections during the initial three-month trial, the project encountered resistance from clinicians, leading to a narrowing of its original scope. As a result, plans to expand the rollout to include predictive models for falls and pressure injuries were postponed. Negative perceptions among clinical staff limited the system's uptake, necessitating a revision of engagement strategies to rebuild trust and promote collaboration. At an organisational level, NMHS is actively working to enhance digital maturity by strengthening the capabilities of its workforce, systems, and infrastructure. The resistance encountered in this initiative underscores a broader need for education and exposure to technology-enabled, data-informed models of care, especially within clinical environments where change is often met with caution.

One key lesson from the project is that the ambition of digital transformation must be balanced with the organisation's readiness for change. Aligning the pace of implementation with stakeholders' willingness to adapt is critical to achieving sustainable, long-term impact.

EFFECTIVENESS OF MROC TRIAL

The mROC pilot trial delivered strong evidence of clinical and financial benefits, particularly in reducing hospital-acquired urinary tract infections (UTIs). Over a six-month period, a Difference-in-Differences (DiD) analysis demonstrated a 41.6% reduction in UTI incidence, from 2.79 to 1.63 per 1,000 bed days, across trial wards, accompanied by a 69% reduction in associated hospital-acquired complication (HAC) penalties.

TABLE 1: COMPARISON ANALYSIS ON REPORTED UTI IN TRIAL WARDS - MARCH TO AUGUST

| Trial Ward | 2024 | | | | 2025 | | | |
|-----------------|-----------|---------------|---------------------------|-------------------|-----------|---------------|---------------------------|------------------|
| | UTIs | Total Beddays | UTI rate per 1000 beddays | HACs Penalty | UTIs | Total Beddays | UTI rate per 1000 beddays | HACs Penalty |
| Ward 5 | 10 | 4,979 | 2.01 | \$ 9,985 | 7 | 4,066 | 1.72 | \$ 2,891 |
| Ward C17 | 14 | 4,964 | 2.82 | \$ 14,139 | 6 | 4,486 | 1.34 | \$ 7,489 |
| Ward G51 | 6 | 5,578 | 1.08 | \$ 6,371 | 7 | 5,179 | 1.35 | \$ 14,375 |
| Ward G52 | 25 | 3,934 | 6.35 | \$ 132,925 | 9 | 3,966 | 2.27 | \$ 25,419 |
| Ward G66 | 9 | 3,511 | 2.56 | \$ 25,276 | 5 | 3,123 | 1.60 | \$ 8,788 |
| Total | 64 | 22,966 | 2.79 | \$ 188,697 | 34 | 20,820 | 1.63 | \$ 58,961 |

These improvements translated into substantial cost savings, with the most significant reduction observed in Ward G52, where UTI rates declined from 6.35 to 2.27 per 1,000 bed days. Notably, this impact extended beyond numerical outcomes. The results reflected enhanced patient safety and strengthened the case for broader implementation of AI-assisted risk prediction tools.

However, questions were raised regarding whether these improvements stemmed solely from the mROC intervention or from general hospital-wide quality improvements. To address this, a comparative analysis between trial and non-trial wards was conducted. Trial wards showed a 31% greater improvement in UTI reduction than non-trial wards, where UTI rates decreased by only 10.6%. This differential reinforces the conclusion that the observed benefits were primarily attributable to the mROC intervention and not external systemic changes.

TABLE 2: COMPARISON ANALYSIS ON REPORTED UTI IN TRIAL AND NON-TRIAL WARDS- MARCH TO AUGUST

| Wards Type | 2024 | | | 2025 | | | Improvement |
|-------------------------|------------|---------------|---------------------------|------------|---------------|---------------------------|--------------|
| | UTIs | Total Beddays | UTI rate per '000 beddays | UTIs | Total Beddays | UTI rate per '000 beddays | |
| Trial Wards | 64 | 22,964 | 2.79 | 34 | 20,820 | 1.63 | 41.6% |
| Non-Trial Wards* | 116 | 68,227 | 1.7 | 99 | 65,200 | 1.52 | 10.6% |
| Total | 180 | 91,191 | 1.97 | 133 | 86,020 | 1.55 | |

The effectiveness of the mROC tool aligns with existing evidence on the power of data feedback and awareness in driving clinical improvement. For instance:

- The SENIC Project [6] demonstrated that simply providing feedback on surgical infection rates led to measurable improvements.
- A hospital-wide hand hygiene campaign in Geneva [7] reduced infection rates through awareness alone.
- Cochrane reviews and CAUTI (catheter-associated UTI) quality improvement initiatives [8] consistently support the use of feedback, unit-level awareness tools, and scorecards to influence behaviour.
- The Hawthorne Effect [9]—where individuals modify behaviour due to the awareness of being observed—further contextualises how increased attention via mROC may have impacted care practices.

In light of these outcomes, the study reinforces a critical insight: while AI tools like mROC are technologically robust, their true value is unlocked through strategic implementation that prioritises behaviour change, clinician engagement, and transparent performance monitoring.

Importantly, mROC functioned not only as a predictive engine but as a catalyst for heightened awareness and intervention.

Ultimately, the success of the mROC trial illustrates that the core challenge in AI deployment lies not in the algorithm itself, but in the human systems surrounding its adoption. The trial validates mROC's predictive efficacy and underscores the need for integrated change management approaches to support future scalability and sustainability.

CONCLUSION AND RECOMMENDATIONS

The implementation of AI-driven prediction tools like mROC offers a promising avenue for improving patient safety and optimising healthcare resources. However, challenges related to clinician resistance, concerns about predictive accuracy, and fears of increased accountability must be addressed to ensure successful adoption [3].

KEY RECOMMENDATIONS:

1. Establish change management functions from the outset of the idea [5] to ensure the solution aligns with clinical expectations and drives acceptance.
2. Enhance clinician engagement from early development stages to foster trust and collaboration.
3. Define the role of the tool in the model of care early to set the expectation of mROC as a clinical decision support rather than a hands-off clinical decision-making initiative to counteract concerns of accountability and job displacement.
4. Improve transparency and communication by sharing clear, data-backed evidence of AI effectiveness.
5. Ensure real-time adaptability of AI predictions to capture changing patient conditions.
6. Conduct phased pilot trials with clear success indicators to validate AI tools before full-scale adoption.
7. Foster a culture of learning and innovation, emphasising that failure in improvement projects will not be penalised.

By addressing these challenges, AI-driven clinical decision support tools like mROC can unlock new efficiencies in patient care while ensuring broad acceptance and sustainable integration into hospital workflows [4].

ETHICAL CONSIDERATIONS

This project was classified as a quality improvement initiative and, therefore, did not require formal ethics approval. Approval from the designated data custodian was obtained prior to accessing and analysing the data. The analysis utilised aggregated information sourced from the organisation's internal data repository, solely for the purpose of evaluating the impact of the pilot project. No interventions or modifications were made to existing system data.

Additionally, the outcomes of the pilot are not intended to inform or implement changes to clinical or administrative processes within the healthcare setting.

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SUSTAINING SERVANT LEADERSHIP IN HEALTHCARE: THE ROLES OF RESILIENCE AND PROSOCIAL MOTIVATION IN ENHANCING LEADER WORK ENGAGEMENT

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ABSTRACT

The beneficial effects of servant leadership on followers have been extensively studied; however, the impact of this leadership style on leaders who employ it has been less well studied. Taking the support of Self-Determination Theory and Conservation of Resources Theory, this research investigates how two personal resources—prosocial motivation and resilience—shape servant leadership behaviour and, in turn, influence leader work engagement in healthcare organisations.

A cross-sectional study was conducted among 168 healthcare leaders in India. The Confirmatory Factor Analysis (CFA) results showed that the four variables of the conceptual model are fairly distinct from each other, and structural equation modelling revealed that both prosocial motivation ($\beta = 0.458, p < .001$) and resilience ($\beta = 0.375, p < .001$) significantly predicted servant leadership behaviour. Servant leadership, in turn, positively predicted leader work engagement ($\beta = 0.380, p = .001$). Mediation analysis confirmed that servant leadership behaviour fully mediated the effect of prosocial motivation and partially mediated the effect of resilience on leader work engagement. Interestingly, unlike resilience, prosocial motivation showed no direct impact on engagement, indicating that behavioral enactment is necessary for converting motivational dispositions into sustained vitality.

These findings suggest valuable additions to the servant leadership theory by highlighting the behavioral tendencies through which personal resources affect leader engagement. Practically, they suggest that healthcare organisations should foster prosocial and resilient dispositions and support servant leadership behaviours through training, introspection, and relational feedback. By doing so, organizations can cultivate emotionally sustainable leadership in high-stress clinical environments.

KEYWORDS

servant leadership; resilience; prosocial motivation; leader work engagement; healthcare leadership; emotional sustainability

INTRODUCTION

Healthcare leadership is challenging, as the role demands technical competence and requires leaders to be emotionally resilient, have ethical clarity, and relational depth [1]. Globally, healthcare systems struggle to keep their leaders engaged amid concerns such as burnout, moral distress, and workforce shortages. Servant leadership, which emphasizes prioritising the needs of employees and patients, empathy, and empowerment, offers a solution to address these challenges. However, the antecedents that enable servant leaders to maintain high work engagement remain underexplored [2]. This study adopts an actor-centric perspective as it investigates how two personal resources—resilience and prosocial motivation—predict servant leadership behavior, and how servant leadership, in turn, enhances leader work engagement by using the theories of Self-Determination [3], Conservation of Resources [4], and Servant Leadership [5]. Our conceptual framework is presented in Figure 1.

While prior research has shown that servant leadership results in positive employee outcomes such as job satisfaction, commitment, and performance [6], fewer studies have examined servant leadership behavior's influence on leaders—especially in healthcare contexts where emotional labor and ethical complexity are high. Moreover, the role of resilience—the capacity to withstand difficulties—and prosocial motivation—the desire to benefit others—as predictors of servant leadership remains under-theorized.

This paper contributes to the literature by empirically testing a mediation model in which resilience and prosocial motivation predict servant leadership behavior, predicting leader work engagement. The findings have implications for leadership development, emotional sustainability, and ethical climate in healthcare organizations.

LITERATURE REVIEW

SERVANT LEADERSHIP IN HEALTHCARE

Servant leadership has been operationalized through dimensions such as emotional healing, putting others first, and helping subordinates grow [7]. In healthcare settings, servant leadership enhanced leader involvement and enthusiasm at work and reduced adverse employee outcomes, such as disengagement [8]. Studies show that servant leadership is positively related to collaboration among nurses [9], proactive behavior [11], pro-environmental behavior [11], and reduced turnover intentions.

However, servant leadership is more than a trait—it is a behavior that requires emotional and motivational resources to perform efficiently in high-stress environments like hospitals. Leaders must regulate their emotions, bounce back from adversities, and stay engaged despite workplace tensions. Hence, we must understand what makes leaders maintain consistent engagement levels at work.

RESILIENCE AS A PREDICTOR OF SERVANT LEADERSHIP

The ability of individuals to face adversities, handle them efficiently, and thereby improve their problem-solving skills is known as resilience. It is not just about "bouncing back" but forwarding with greater strength or insight [12]. In healthcare, resilience helps leaders manage emotional labor, moral distress, and crises [13,14]. According to the Conservation of Resources Theory, resilient individuals protect and mobilize resources to maintain functioning. Recent studies suggest that resilience predicts ethical leadership and emotional intelligence; however, its role in servant leadership remains less explored.

We propose that resilience helps leaders be emotionally stable and receptive, which promotes servant leadership traits like empowerment, empathy, and healing.

PROSOCIAL MOTIVATION AND SERVANT LEADERSHIP

Prosocial motivation is the desire to help others and contribute to their well-being [15]. It is a resource essential to healthcare workers and is consistent with servant leadership [16]. According to the theory of Self-Determination, prosocial and other forms of autonomous motivation increase moral behavior and participation. Leaders who desire to serve are more likely to prioritize others, become active listeners, and encourage growth—the fundamental tenets of servant leadership.

It has been reported that job satisfaction was a mediator between emotional intelligence and intrinsic motivation as predictors of job performance among nurses [17]. We apply this reasoning to leadership behavior and contend that servant leadership is fueled by prosocial drive.

SERVANT LEADERSHIP AND WORK ENGAGEMENT

When employees display high energy, enthusiasm, and participation and take pride in their work, they are said to be engaged [18]. Research showed that servant leadership was positively related to creativity through the mediators of psychological safety and employee well-being [19]. While most studies examine how servant leadership affects followers' engagement, we focus on leader work engagement—a critical but understudied outcome.

When enacted authentically, we hypothesise that servant leadership behaviour reinforces leaders' sense of purpose and connection, sustaining their engagement.

THEORY AND HYPOTHESES

SELF-DETERMINATION THEORY (SDT)

Self-Determination Theory asserts that individuals are most motivated when their basic psychological needs for autonomy, competence, and relatedness are fulfilled. In leadership settings, SDT explains how the intrinsic motivation to help others can lead to sustained work engagement. Prosocial motivation is a form of autonomous motivation that satisfies the SDT needs for relatedness and purpose [20]. Servant leadership behavior—which involves empowering others and putting others first—is a natural manifestation of a leader's prosocial motivation [21].

Hypothesis 1: Prosocial motivation positively predicts servant leadership behavior.

CONSERVATION OF RESOURCES THEORY (COR)

The COR Theory posits that when stressed, individuals strive to obtain, retain, and protect valuable resources. Resilience is viewed as a key personal resource that enables individuals to deal with hardships and continue functioning efficiently. In healthcare leadership, resilience helps leaders gather their emotional strength and continue serving others, such as employees and patients [22]. The COR also explains how resourceful leaders invest their resources, such as emotional energies, to enrich their resource pool. Hence, servant leaders invest their resilience to engage more at work and gain additional resources.

Hypothesis 2: Resilience positively predicts servant leadership behavior.

SERVANT LEADERSHIP THEORY

Servant Leadership Theory emphasises the leader's inclination to serve first prioritising the needs of followers over their own, fostering growth, and promoting ethical and relational depth. In healthcare, servant leadership has been linked to improved team collaboration, reduced burnout, and enhanced patient outcomes. While the relationship between servant leadership behavior and positive employee outcomes is well-established in the literature, we propose that enacting servant leadership can also benefit leaders, as it reinforces leaders' sense of purpose and work meaningfulness [23]. By engaging in meaningful, values-driven behavior, leaders experience greater vigor and dedication.

Hypothesis 3: Servant leadership behavior positively predicts leader work engagement.

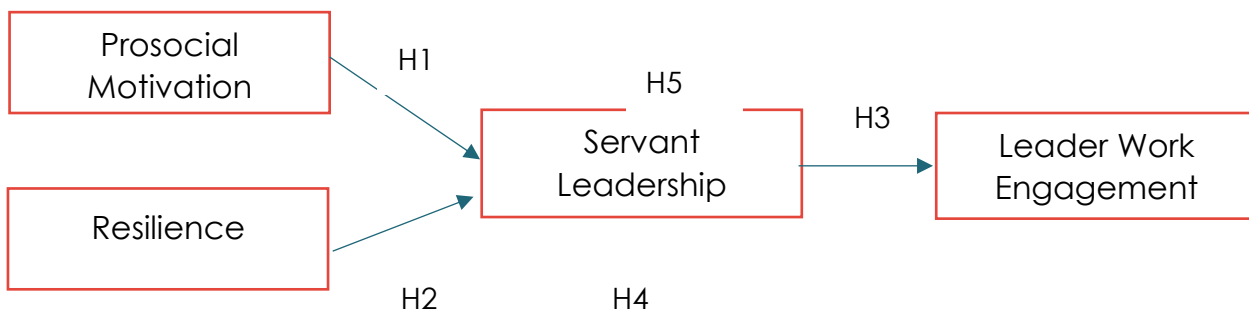
SERVANT LEADERSHIP BEHAVIOR AS A MEDIATOR

Resilience enables leaders to enact servant leadership behaviors even under stress. These behaviors, in turn, enhance engagement by fostering confidence and work meaningfulness. Thus, servant leadership is a behavioral channel through which resilience translates into sustained work engagement. Prosocially motivated leaders are inclined to serve others; this behavioral enactment reinforces their engagement. Servant leadership offers a mechanism through which intrinsic motivation is expressed, resulting in greater engagement and dedication at work. The SDT supports this pathway by linking autonomous motivation to sustained well-being and performance.

Hypothesis 4: The relationship between prosocial motivation and leader work engagement is mediated by servant leadership behavior.

Hypothesis 5: The relationship between resilience and leader work engagement is mediated by servant leadership behavior.

FIGURE 1: CONCEPTUAL FRAMEWORK



METHOD

SAMPLE AND PROCEDURE

A cross-sectional survey design was employed to assess the relationships between resilience, prosocial motivation, servant leadership behavior, and leader work engagement among healthcare leaders. We approached the CEOs of hospitals and healthcare organizations and invited them to support the study. Upon agreement, they assigned their HR managers to assist us with the survey. The HR managers provided us with the contact details of employees in formal leadership roles who were willing to participate. A purposive sampling technique was used to ensure that only leaders were included in the study. To enforce this, the survey began with a filter question on leadership tenure; those without leadership experience were automatically exited from the survey questionnaire.

Ethical approval was obtained from the institutional ethics committee before data collection. Participants were informed that the study was conducted for academic purposes, their responses would be confidential, participation was voluntary, and informed consent was obtained. We included attention-check questions to mitigate the risk of common method bias and ensure data quality. The responses from participants who wrongly answered these questions were excluded. Of the 244 responses collected, 76 were removed due to failed attention checks and incomplete responses, resulting in a final sample of 168 healthcare leaders.

Demographic characteristics were as follows: 57.6% male and 42.4% female. Age distribution was 1% under 34 years, 5% between 35–44 years, 39% between 45–54 years, and 55% between 55–64 years. Leadership experience varied: 15% had less than one year, 39% had 1–5 years, 9% had 6–10 years, and 37% had more than 10 years. Marital status was 32.5% single and 67.5% married. Annual income levels were: 31% below ₹5,00,000, 28% between ₹6–10 lakh, 16% between ₹11–15 lakh, 6% between ₹16–20 lakh, and 19% above ₹20 lakh.

MEASURES

To reduce common method bias and improve attentiveness, we used a 5-point Likert scale for two constructs and a 7-point Likert scale for the remaining two.

Prosocial motivation. This was measured using a four-item scale developed by Grant [24], rated on a 5-point scale (1 = strongly disagree, 5 = strongly agree). An introductory question asked, "Why are you motivated to do your work?" One of the items is "because I care about benefiting others through my work." Reliability was acceptable ($\alpha = .86$).

Resilience. Leader resilience was captured using a six-item scale by Smith et al. [25], rated on a 5-point scale. An example item is "I tend to bounce back quickly after hard times." The scale reliability was strong ($\alpha = .91$).

Servant leadership behavior. We adapted Liden et al.'s [26] scale to measure servant leadership behavior of leaders. Items were rated on a 7-point scale. The original scale was designed for employees to rate the servant leadership of their managers. We replaced "My manager" with "I" for every item, for leaders' self-assessment. This adaptation is widely accepted in leadership research [27]. A sample item is "I can tell if something work-related is going wrong." Internal consistency was acceptable ($\alpha = .77$).

Leader work engagement. Engagement was assessed using a three-item scale by Schaufeli et al. [27]. A sample item is "At my work, I feel bursting with energy." Reliability was moderate ($\alpha = .64$; $\omega = .75$). Removing the first item increased reliability ($\alpha = .81$), but the full scale was retained due to theoretical relevance.

Control variables. We controlled the demographic characteristics like age, gender, marital status, leadership experience, and annual income to remove the potential confounding effects.

RESULTS

CONFIRMATORY FACTOR ANALYSIS AND DESCRIPTIVE STATISTICS

We tested the proposed model using Jamovi version 2.4.11 and Mplus version 8.11. Confirmatory Factor Analysis (CFA) assessed the discriminant validity of four constructs: prosocial motivation, resilience, servant leadership, and work engagement. Table 1 presents CFA results. In comparison models, servant leadership and work engagement were merged (three-factor), or prosocial motivation and resilience were combined (two-factor), or all items loaded onto one factor (one-factor). The four-factor model showed superior fit: $\chi^2(164) = 247.97$, $p < .001$; TLI = 0.940; CFI = 0.949; RMSEA = 0.055; SRMR = 0.056.

All standardized factor loadings were significant ($p < .001$), ranging from 0.397 to 0.933, exceeding the recommended 0.50 threshold (Hair et al., 2009), supporting convergent validity. Although composite reliability and AVE were not computed, standardized loadings and inter-factor correlations support construct distinctiveness.

To assess common method variance (CMV), Harman's single-factor test was conducted in Jamovi. The first factor did not account for the majority of variance, with loadings from 0.355 to 0.772, suggesting CMV is unlikely to bias results.

Table 2 shows that all constructs were significantly and positively correlated, with the strongest associations between servant leadership and work engagement ($r = .623$, $p < .001$).

TABLE 1: CONFIRMATORY FACTOR ANALYSIS

| Model | χ^2 | df | χ^2/df | CFI | TLI | RMSEA | SRMR |
|--------------------|----------|-----|-------------|-------|-------|-------|-------|
| Four-factor model | 247.97 | 164 | 1.51 | 0.949 | 0.940 | 0.055 | 0.056 |
| Three-factor model | 412.35 | 167 | 2.47 | 0.882 | 0.864 | 0.089 | 0.078 |
| Two-factor model | 589.62 | 169 | 3.49 | 0.821 | 0.793 | 0.104 | 0.092 |
| One-factor model | 734.88 | 170 | 4.32 | 0.765 | 0.732 | 0.118 | 0.106 |

TABLE 2: MEANS, STANDARD DEVIATIONS, AND CORRELATIONS

| Variable | M | SD | 1 | 2 | 3 | 4 |
|-------------------------|------|------|---------|---------|---------|---|
| 1. Prosocial Motivation | 4.45 | 0.56 | — | | | |
| 2. Resilience | 3.91 | 0.69 | .457*** | — | | |
| 3. Servant Leadership | 6.10 | 0.88 | .630*** | .584*** | — | |
| 4. Work Engagement | 5.41 | 0.92 | .441*** | .625*** | .623*** | — |

Note. M = Mean; SD = Standard Deviation. ** $p < .001$.

HYPOTHESES TESTING

The structural model was tested using Mplus version 8.11 with maximum likelihood estimation. The model demonstrated good fit: $\chi^2(164) = 247.97$, $p < .001$; CFI = 0.949; TLI = 0.940; RMSEA = 0.055 [90% CI: 0.041, 0.069]; SRMR = 0.056. These indices indicate an acceptable fit between the hypothesized model and the observed data.

DIRECT EFFECTS

As shown in Table 3, prosocial motivation significantly predicted servant leadership behavior ($\beta = 0.458$, SE = 0.077, 95% CI [0.306, 0.610], $p < .001$), supporting Hypothesis 1. Resilience also had a significant positive effect on servant leadership behavior ($\beta = 0.375$, SE = 0.078, 95% CI [0.222, 0.528], $p < .001$), supporting Hypothesis 2. Servant leadership behavior significantly predicted leader work engagement ($\beta = 0.380$, SE = 0.112, 95% CI [0.160, 0.600], $p = .001$), supporting Hypothesis 3.

INDIRECT EFFECTS (MEDIATION)

Mediation analysis revealed significant indirect effects of prosocial motivation and resilience on work engagement via servant leadership behavior. These findings support Hypothesis 4 and Hypothesis 5. Mediation analysis confirmed that servant leadership behavior fully mediated the effect of prosocial motivation on leader work engagement and partially mediated the effect of resilience on leader work engagement.

TABLE 3: REGRESSION RESULTS FOR DIRECT AND MEDIATING EFFECTS (N = 168)

| Hypothesis | Path | Effect | S.E | 95% CI | Significance |
|------------|--|-----------------|------|---------------------|--------------|
| H1 | Prosocial Motivation → Servant Leadership Behavior | 0.458 | .077 | [.306, .610] | < .001 |
| H2 | Resilience → Servant Leadership Behavior | 0.375 | .078 | [.222, .528] | < .001 |
| H3 | Servant Leadership Behavior → Leader Work Engagement | 0.380 | .112 | [.160, .600] | .001 |
| H4 | Prosocial motivation → SLB → Leader Work Engagement | Indirect effect | — | Significant via SLB | < .001 |
| H5 | Resilience → SLB → Leader Work Engagement | Indirect effect | — | Significant via SLB | < .001 |

DISCUSSION AND CONCLUSION

This study investigated how prosocial motivation and resilience influence servant leadership behavior and, in turn, leader work engagement in healthcare settings. The structural model demonstrated good fit, and the hypotheses were supported. Specifically, prosocial motivation and resilience significantly predicted servant leadership behavior, positively influencing leader work engagement. These results support the idea that leaders are likely to exhibit servant leadership when they are motivated to strive for others' well-being and have the mettle to face adverse circumstances. This behavior can cultivate a sense of vitality at work.

Significantly, servant leadership behavior mediated the effects of prosocial motivation and resilience on work engagement. This implies that while prosocial and resilient leaders may be inclined to be engaged at work, their servant leadership behavior enables them to convert these traits into sustained energy and involvement. The insignificant direct effect of prosocial motivation on work engagement indicates that the motivation to serve others alone cannot ensure high engagement levels of leaders; what is important is the leader's effort to translate the motivation into action by employing servant leadership behavior at work.

These results contribute to leadership and healthcare management literature by identifying servant leadership as a key mechanism linking personal attributes to engagement outcomes. The findings underscore the value of cultivating servant leadership behaviors—such as empathy, listening, and stewardship—especially among leaders with strong prosocial and resilient dispositions. By fostering these behaviors, healthcare organizations can support more engaged, compassionate, and resilient leadership, which is critical for sustaining performance and well-being in demanding clinical environments.

LIMITATIONS AND FUTURE RESEARCH

Despite making significant contributions to healthcare literature, our study is not free from limitations. First, due to its cross-sectional nature, the study design limits the ability to draw causal inferences between prosocial motivation, resilience, servant leadership behavior, and work engagement. Longitudinal or experimental designs would provide more substantial evidence of directionality and temporal dynamics. Second, despite our efforts to mitigate the risk of same-source bias and common method variance using scale variation and attention-check questions, gathering data from multiple sources could reduce social desirability bias and the risk of inflated associations between the study variables.

Third, due to the restriction of the sample to healthcare leaders in India, the study might compromise on the generalizability of the findings to other cultural or organizational contexts. Leadership behaviors and motivational dynamics may differ across sectors or regions. Fourth, while the study focused on servant leadership as a mediating mechanism, other potential mediators—such as psychological safety, emotional exhaustion, or organizational support—were not examined.

Future research could explore these alternative pathways and test moderated mediation models to assess how contextual factors (e.g., organizational culture, workload, or team climate) influence the strength of these relationships. Additionally, incorporating multi-source data (e.g., peer or subordinate ratings) would strengthen the validity of leadership behavior assessments. Expanding the scope to include diverse leadership levels and healthcare systems would further enrich understanding.

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TRANSFORMING EMERGENCY CARE: THE IMPACT OF REAL-TIME AND PREDICTIVE ANALYTICS ON ED OPERATIONS

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ABSTRACT

Emergency department (ED) overcrowding is a persistent global issue driven by growing patient volumes, limited hospital bed availability, and inefficient resource allocation. At Sir Charles Gairdner Hospital (SCGH), a 600-bed quaternary centre treating over 75,000 high-acuity patients annually, these pressures have been compounded by reduced access to transitional care. In response, SCGH developed a real-time and predictive analytics system to optimise patient flow and improve operational efficiency.

This study presents the ED BRAG Capacity Escalation System, a data-driven solution integrating real-time monitoring and artificial intelligence (AI) to enhance clinical decision-making. The model is built on three core metrics i.e. presentation numbers, admitted patient count, and waiting room occupancy, used to generate a BRAG (Black-Red-Amber-Green) status to objectively assess ED capacity. By utilising Microsoft Azure AI services, the system forecasts ED trends up to 10 hours in advance and processes over 40 supplementary risk indicators, such as ambulance ramping and mental health presentations.

Post-implementation data indicate notable improvements in performance, including more efficient ambulance transfers, timely triage, and reduced departure delays compared to other tertiary hospitals. These results underscore the transformative potential of real-time and predictive analytics in enhancing emergency care [6]. Future research should explore broader deployment to assess adaptability and long-term impact.

KEYWORDS

Emergency Care, transitional care, predictive analytics

INTRODUCTION

Ovidendatur, nesto qui officid modi offic tes debis volore laut viducid erumquam voluptaeprea et est, simolor epernatia Sir Charles Gairdner Hospital (SCGH) operates a large emergency department with a high-acuity patient population, including many elderly individuals, leading to an admission rate of nearly 45%. Annual ED presentations have increased by over 6% in recent years, while hospital bed availability has decreased, intensifying pressures on emergency services. A reduction in effective hospital capacity, combined with inadequate access to residential aged care, has led to access block and critical ED overcrowding. During peak periods, hospital occupancy exceeds 100%, and the ED often lacks the ability to absorb even baseline demand.

Traditional resource allocation strategies rely on manual systems that are time-consuming and dependent on subjective input from experienced clinicians. In highly dynamic environments, this approach is neither scalable nor efficient. In response, the SCGH team developed a real-time and predictive escalation tool based on fundamental ED metrics that allow standardised, automated monitoring of patient flow and operational risk.

The system was designed to provide universal applicability across health networks while retaining the flexibility to incorporate department-specific data. Central to its success was the integration of real-time location data, standardised definitions of ED capacity, and predictive analytics to anticipate patient surges. Predictive analytics significantly enhance operational efficiency by optimising resource allocation, streamlining patient prioritisation, and enabling timely clinical interventions [1]. A core innovation was the replacement of manual alert systems with automated, data-driven notifications, empowering clinical teams to make timely and informed decisions based on real-time and forecasted demand.

OPERATIONAL CHALLENGES IN EMERGENCY DEPARTMENTS

EDs in tertiary hospitals function as complex networks, moving patients through triage, clinical assessment, diagnostics, treatment, and eventually discharge or admission. However, a series of systemic problems hinder flow efficiency and introduce significant patient safety risks [2].

One major issue is the fragmentation of clinical data across siloed systems. Clinicians must consult multiple platforms to build a complete picture of patient progress, increasing administrative workload and risk of error. The lack of a unified real-time overview obstructs coordination with inpatient wards, impeding timely patient transfers and contributing to ED congestion. These delays can compromise the timeliness of care for acutely ill patients, heightening the risk of adverse clinical outcomes.

Additionally, functional ED capacity is often misrepresented. In theory, ED beds are intended for short-term emergency care; in practice, many are occupied by admitted patients awaiting transfer, reducing availability for new emergencies and prolonging wait times. Existing systems lack visibility into overburdened zones within the ED and do not provide actionable insights for reallocating resources efficiently.

Another core challenge is the limited awareness by other departments of ED operational pressures. Without clear communication and shared data, hospital services may inadvertently undermine ED performance. Manual processes such as headcounts remain common for workload assessment, consuming senior staff time and delaying critical interventions.

Moreover, the inability to transfer patients into inpatient or mental health services when these downstream facilities are at full capacity exacerbates ED congestion. This not only prolongs ED stays but also creates backlogs across the care continuum, preventing timely admission of new patients and straining the entire hospital system [4, 5, 7].

STUDY OBJECTIVE AND DESIGN OF THE ED BRAG SYSTEM

SCGH sought to address these issues by developing an automated escalation system capable of assessing ED capacity and forecasting future demand. The tool focuses on three key metrics: the total number of ED presentations, the number of admitted patients, and the volume of individuals waiting to be seen. These indicators were selected for their broad applicability and ability to reflect real-time pressure on ED resources.

The patient journey is typically divided into three stages: arrival and triage, clinical assessment and treatment, and a disposition decision that determines whether the patient is discharged, transferred, or admitted. The BRAG system was designed to monitor and support decisions at each stage. It incorporates a dynamic classification model that continuously evaluates operational thresholds and calculates the ED's capacity status accordingly.

The innovation lies not just in real-time monitoring, but in forecasting stress points. By applying AI algorithms to historical and live data, the system predicts surges in presentations and potential bottlenecks in waiting areas or assessment zones. It enables staff to plan resource allocation proactively rather than respond reactively once strain is already visible.

REAL-TIME MONITORING AND PREDICTIVE FORECASTING

The BRAG system integrates with existing hospital applications to extract over 40 key data indicators that shape the real-time status of ED operations. These include waiting room occupancy, ambulance offload delays, prolonged patient stays, mental health case load, and the availability of observation or resuscitation beds.

Data are visualised through a dashboard updated every 15 minutes, providing up-to-date insights to clinicians, managers, and executives. The colour-coded BRAG system reflects the ED's current capacity and anticipated strain levels, ensuring that all stakeholders are aligned to operational status and can act accordingly.

To forecast future demand, the system uses Azure-based machine learning models trained on extensive historical data. These models estimate hourly ED presentations, likely admissions, and anticipated waiting room congestion up to 10 hours in advance. The visualisation presents these trends on a timeline graph, clearly marking projected volumes and critical risk periods.

This level of foresight allows hospital teams to pre-emptively manage high-demand periods. For example, if a predicted surge in ambulance arrivals is identified, staff can reassign resources, prioritise discharges, or activate overflow protocols in advance. This proactive capacity management marks a shift from traditional, reactive models of emergency care.

COLLABORATIVE IMPLEMENTATION AND SYSTEM INTEGRATION

The BRAG system was developed through cross-disciplinary collaboration involving clinicians, data analysts, operational leaders, and IT professionals. This ensured that the tool addressed real-world challenges and could be smoothly integrated with existing infrastructure.

Rather than replacing current systems, BRAG complements them by acting as a centralised layer of intelligence. It provides continuous updates and automated alerts, reducing reliance

on manual tracking and freeing up senior clinical staff for direct patient care. It also standardises decision-making by replacing subjective assessments with objective, data-driven metrics.

EVALUATION AND KEY RESULTS

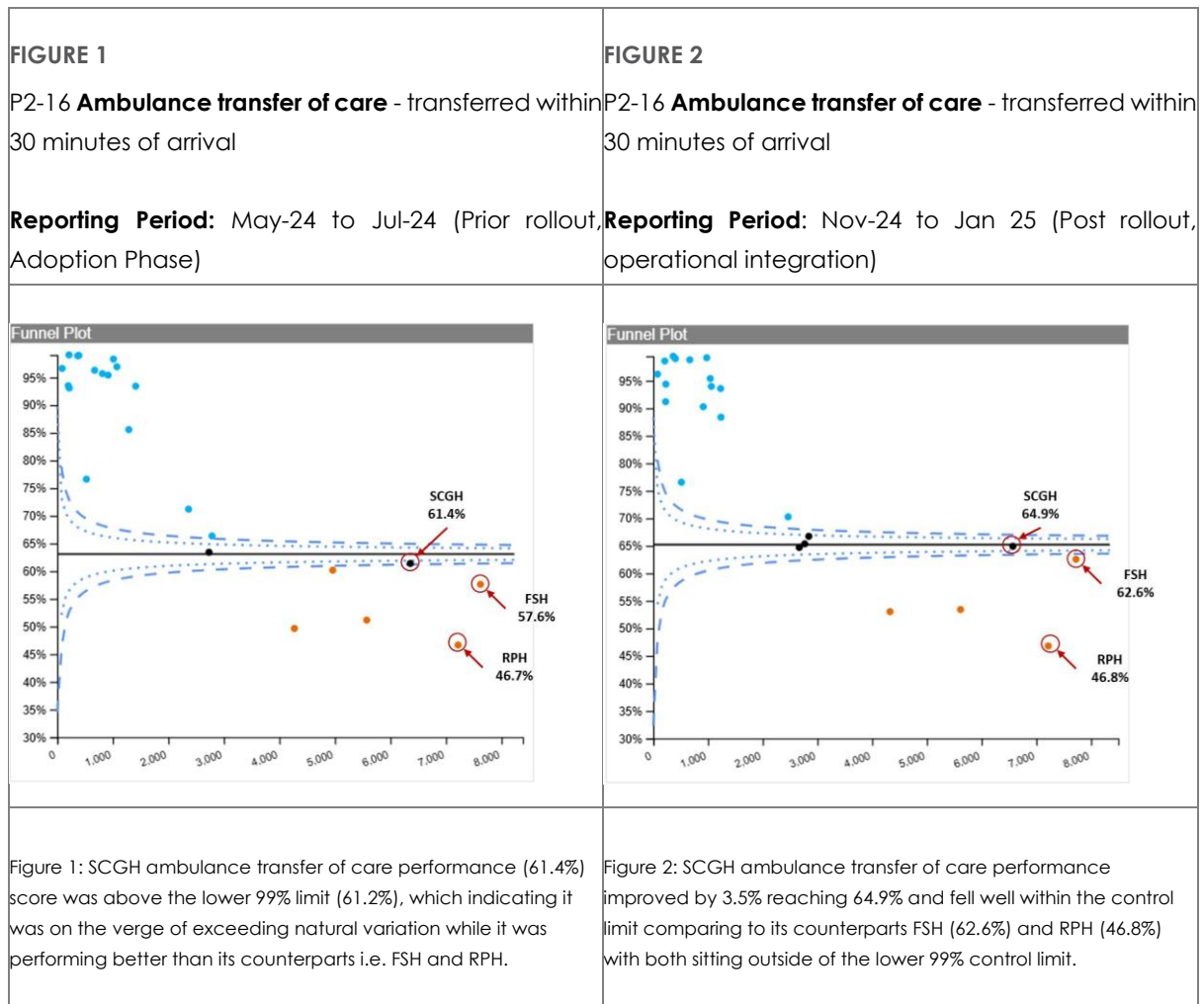
The project has been live in a production environment since June 2024, with an ongoing evaluation assessing its impact on ED performance and efficiency metrics. As emergency department (ED) demand continues to rise across Western Australia, where monthly ED presentations have increased by at least 4% compared to the same period in the previous

year—teaching and tertiary hospitals are facing growing challenges in managing patient flow. However, a comparison of ED key performance indicators (KPIs) before and after the implementation of ED BRAG shows that SCGH has achieved notable improvements relative to two comparable metropolitan hospitals, represented as FSH and RPH in this study. Table 1 KPIs illustrate SCGH's efficiency gains, comparing performance across the reporting periods before and after the ED BRAG rollout, considering both the adoption phase and its full operational integration.

TABLE 1: WESTERN AUSTRALIA HOSPITAL SERVICE PERFORMANCE REPORTING (HSPR) FRAMEWORK KPIs

| Teaching & tertiary public hospitals in metro | Sir Charles Gairdner Hospital (SCGH) | Fiona Stanley Hospital (FSH) | Royal Perth Hospital (RPH) | | | |
|--|--|--|----------------------------|------------------|------------------|------------------|
| KPI | May-24 to Jul-24 (Prior rollout, Adoption Phase) | Nov-24 to Jan-25 (Post rollout, operational integration) | May-24 to Jul-24 | Nov-24 to Jan-25 | May-24 to Jul-24 | Nov-24 to Jan-25 |
| P2-16 Emergency ambulance transfer of care -Percentage of patients transferred within 30 minutes of arrival | 61.4% | 64.9% (improve 3.5%) | 57.6% | 62.6% | 46.7% | 46.8% |
| P2-3b Percentage of emergency department patients seen within recommended times: b) % Triage Category 2 (Seen within 10 minutes) | 76.3% | 78.8% (improve 2.5%) | 47.9% | 50.4% | 68.8% | 62.6% |
| P4-3b Percentage of Emergency Department patients who did not wait or left at own risk: b) Non-Aboriginal patients | 6.28% | 6.19% (Improve 0.1%) | 10.72% | 13.35% | 9.07 | 10.36% |

The funnel plot charts (Figures 1 and 2) illustrates the KPI P2-16 Ambulance Transfer of Care within 30 minutes performance indicator across all public hospitals with emergency departments in Western Australia. While most teaching and tertiary hospitals fall below the control limits, SCGH has demonstrated notable improvement in this KPI, despite the rising demand for ED services. This positive trend has been observed during the monitoring control period following the implementation of the ED BRAG system.



The primary objective of the automated system is to significantly reduce the administrative burden on senior nursing staff, saving valuable hours previously spent on manual processes. It has enhanced ED visibility for hospital staff, enabling them to identify delays and high-risk areas more effectively. By facilitating timely interventions, the system has optimised patient flow and resource allocation, ensuring a more efficient and responsive emergency department³. A number of SCGH's ED performance KPIs now reflect quantifiable improvements, outperforming similar facilities across Western Australia.

CONCLUSION

The ED BRAG Capacity Escalation System at SCGH represents a significant advance in emergency care delivery. By combining real-time operational monitoring with AI-based predictive analytics, the system offers a robust framework for managing ED flow, reducing congestion, and enhancing patient care. Results from the system's initial deployment show quantifiable benefits, including reduced administrative workload, improved patient throughput, and better coordination between hospital departments. As emergency departments globally face mounting demand and complexity, systems like BRAG provide a scalable, adaptable solution to improving performance and outcomes.

Future work should focus on expanding the system's deployment to other hospitals and health services, tailoring it to local operational nuances, and refining its predictive models using diverse data sets. Ultimately, the success of BRAG illustrates how technology can empower healthcare systems to move from reactive crisis management to proactive, data-driven decision-making.

ETHICAL CONSIDERATIONS

This project was classified as a quality improvement initiative and, therefore, did not require formal ethics approval. Approval from the designated data custodian was obtained prior to accessing and analysing the data. The analysis

utilised aggregated information sourced from the organisation's internal data repository, solely for the purpose of providing visibility to support operational processes. The study focused on local improvements, not publishing new clinical science. Additionally, the outcomes of the pilot are not intended to inform or implement changes to clinical or administrative processes within the healthcare setting.

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EMPOWERING ALLIED HEALTH SERVICE DELIVERY USING INTEGRATED CREDENTIALING AND SCOPE OF PRACTICE SYSTEMS

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EXECUTIVE SUMMARY

Integrated credentialing and scope of practice (CSOP) systems not only safeguard patients; they are a catalyst for innovation and empower health service delivery. An integrated CSOP system ensures regulatory compliance, delivers safe and skilled care, empowers clinicians to expand their capabilities, and enables professions to adapt and innovate within the health system. This report outlines the implementation of a sophisticated CSOP system across 25 Ahpra-registered and self-regulating Allied Health professions within a large metropolitan public health network.[1] With over a decade of refinement, the system enhances service delivery by enabling structured expansion of professional and individual scope of practice, supported by profession-specific CSOP documents, risk-informed processes, and an electronic credentialing platform.[2] In a three-year period, the system has credentialed 1,017 newly employed clinicians, has endorsed 846 changes to individual scope of practice, and has implemented 42 profession-wide scope of practice changes, demonstrating significant impact on workforce capability and patient care.

PROBLEM

Ovidendantur, nesto qui officid modi offic tes debis volore laut viducid erumquam voluptaeprea et est, simolor epernatia derchil es ius verum ex eos doluptas ad qui

The health service provides services across the lifespan at more than 40 sites, with the allied health team consisting of 1,900 professionals and assistants from a diverse mix of 25 Ahpra-registered and self-regulating professions. In addition, it operates in a context where governance responsibilities are devolved to the organisation. This results in significant complexity related to the implementation of CSOP processes.

CSOP processes ensure clinicians are professionally suitable, competent, authorised, and supported to deliver care they are accountable for, within a specific organisational context.³ Historically, processes were limited to verifying required registration/ certifications, qualifications and experience at recruitment, with inconsistent storage of documentary evidence. Processes did not define individual scope of practice beyond a position description, have mechanisms to expand profession or individual scope of practice, nor enable accurate regulatory compliance tracking such as Ahpra registration.[1] Early processes were manual, inconsistent and lacked transparency and agility, making it difficult to identify clinical practices where additional safeguards were warranted.[2]

INTERVENTION

The health network implemented an integrated, risk-informed CSOP system with four key components.

PROFESSION-SPECIFIC CSOP DOCUMENTS:

Developed for 25 professional groups, these documents outline credentialing standards and the available scope of practice for a profession in the organisation.[3,4] They enable delineation of individual scope of practice and are used during recruitment, clinical supervision and scope of practice reviews. Skills beyond routine scope of practice for a profession are listed and categorised using a decision tool according to their risk profile, as either core, additional or specific skills[5]. Additional or specific skills have safeguards that reflect their risk profile. The safeguards vary from reflective practice to formal micro-credentialing against a credentialing standard.

MECHANISMS TO EXPLORE AND EXPAND PROFESSION SCOPE OF PRACTICE:

Consistent processes are applied to evaluate proposed changes to professional scope of practice, focusing on risks and mitigation strategies using our '3 Ps' model. This model explores; the extent of the clinical Practice, the Practice context i.e. where it will be implemented and what are the available supports, as well as how Practitioner competence will be determined. If formal micro-credentialing is required for a skill, a standard is set and endorsed by professional governance decision makers, authorisation processes are determined, and the new scope of practice is integrated into CSOP documents, platforms and processes. Where competency-based training in our workplace is relied on for credentialing, these programs are implemented using a structured evidence-based method.[6]

CONSISTENT PROCESSES TO CHANGE INDIVIDUAL SCOPE OF PRACTICE:

Once a skill is available for the profession and is categorised and listed on the profession's CSOP document, individuals can apply to change their individual scope of practice through the electronic credentialing system. The risk profile of the skill determines the extent of the review process and the evidence required to support credentialing decisions. When endorsed, the individual scope of practice will be visible on an organisational-wide credentialing register.

ELECTRONIC CREDENTIALING SYSTEM:

Centralises credentialing records and documentary evidence, monitors Ahpra registration in real-time and manages applications for individual scope of practice changes. In addition, it allows for declarations against standards for self-regulating professionals and enables the regular review of individual scope of practice.[5]

LEARNING

There are four main insights from the 10-year development journey.

FOCUS ON RISKS AND CONCERNS:

It is neither practical nor desirable to credential every skill. Instead, credentialing should be targeted to higher-risk skills, with due consideration for stakeholder concerns.

COLLABORATIVE DESIGN:

Engagement with clinicians and decision-makers ensures relevance and usability of documents and processes. It fosters trust, addresses individual concerns respectfully, and promotes shared ownership of solutions.

DEDICATED RESOURCING:

The system relies heavily on developed expertise and to sustain the system, ongoing investment is essential.

CONTINUOUS IMPROVEMENT:

Ensures that documents and processes reflect contemporary practice and standards, as well as mitigating emerging risks.

IMPACT FOR PRACTICE

Over a three-year period, the integrated CSOP system has delivered measurable benefits, credentialing and defining the scope of practice for 1,017 new allied health clinicians at recruitment, enabling 846 clinicians to expand their scope of practice, and implementing 42 profession-wide changes to scope of practice within our context.

Expansions to profession scope of practice, have empowered allied health service delivery, here are some examples: Waitlists for access to consultant care in our ear, nose and throat clinics have been reduced by enabling Speech Pathologists to work to the top of their scope and perform nasendoscopy with administration of nasal anaesthetic sprays; service delivery changes in home-based allied health have been supported by the implementation of trans-professional skill sharing; with credentialing for criterion led mobility progression we have been able to optimize the use of Allied Health Assistants and release time for Physiotherapists in the inpatient setting; Advanced Musculoskeletal Physiotherapists providing primary contact care in the emergency department, can be credentialed to initiate and administer single dose analgesics, ensuring patients have timely access to pain relief.

Ultimately, credentialing and scope of practice systems are not merely compliance tools; they are enablers of safe, effective, and innovative care. Organizations adopting similar frameworks can expect improved governance, workforce capability, and patient access.

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CARE COLLECTIVE – SOUTH WEST: THE CO-DESIGN, PILOT AND EVALUATION OF INNOVATIVE PRIMARY CARE MODELS IN FAR SOUTH WEST QUEENSLAND

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EXECUTIVE SUMMARY

The Care Collective – South West Primary Care Pilot (the Pilot) is a Commonwealth funded project aimed to co-develop and test innovative models that improve care integration and enhances hospital and primary health pathways in general practice and the community.

The Pilot focuses on improving health and wellbeing for people with complex conditions in Charleville, Quilpie, Cunnamulla and Thargomindah, four rural and remote communities in South West Queensland, by enhancing collaboration and service coordination among local health and non-health providers, building on existing strengths and addressing service gaps.

This innovative, place-based model for managing chronic conditions, improving access and coordination in rural communities fosters shared ownership and collaboration across local Councils, health services, primary care providers and Aboriginal and Torres Strait Islander community health organisations. It offers a scalable, transferable approach for other rural and remote communities to deliver sustainable, locally tailored health solutions

PROBLEM/ISSUES

A literature review highlighted that rural and remote populations, such as those in the South West Hospital and Health Service (SWHHS) catchment, face significant challenges due to geographic isolation, including limited access to medical services and poorer health outcomes compared to urban areas [1]. Strengthening primary care is a key strategy for improving health outcomes [2], with care coordination for complex chronic conditions being a major challenge [3].

Residents in the SWHHS catchment experience barriers such as long travel distances, limited transport and accommodation, telecommunication constraints, and extreme weather. Remote health and community services also struggle to recruit and retain staff. As one of Queensland's most remote regions, SWHHS faces exceptional difficulties, and health outcomes for First Nations people remain poorer than for non-Indigenous residents and the state average [4].

The four pilot communities experience worse health outcomes than the Queensland average, including:

- Lower average life expectancy

- Higher rates of potentially preventable hospitalisations
- Higher Emergency Department presentations per capita.

INTERVENTION/APPROACHES

The pilot is administered by Queensland Health, in partnership with the SWHHS and the South West Queensland Primary Health Care Alliance. To address the challenges, extensive scoping and co-design was undertaken with health providers, stakeholders, and consumers using a place-based approach to understand community needs and inform the Pilot's design, implementation and evaluation.

An insights-driven approach guided co-design and built a shared understanding of local context and priorities. Scoping combined desktop research, data analysis and stakeholder engagement. Stakeholders highlighted the value of this approach as it ensured decisions were data-driven and aligned with on-the-ground perspectives.

Initial co-design workshops confirmed support for a care coordination approach and commencement of the pilot in the Charleville and Far South West region (Quilpie, Cunnamulla, Thargomindah). Four local groups were established to:

- inform localised co-design of the model,
- guide implementation and,
- provide strategic advice on the approach and priorities.

This approach allows each town to determine which service-level and care coordination Care Collective workforce best addressed their needs and gaps (Table 1).

TABLE 1: CARE COLLECTIVE SOUTH WEST MODEL

| | Charleville | Quilpie | Cunnamulla | Thargomindah |
|--|--|---------------------------------------|---|--|
| Community Service Coordinator <i>Administrative support for the coordination of health and wellbeing services within the region or town</i> | 1FTE Host: Murweh Shire Council | 0.5FTE Host: Quilpie Shire Council | 1FTE Host: Cunnamulla Corporation for Health | 0.5FTE Host: South West Hospital and Health Service |
| Clinical Care Coordinator <i>Qualified health professionals provide clinical care coordination in the primary care setting in partnership with clients, GPs and acute health care providers</i> | 1FTE Host: Charleville & Western Area Aboriginal and Torres Strait Islanders Community Health | | 1FTE Host: Cunnamulla Corporation for Health | 0.5FTE Host: Royal Flying Doctor Service |
| Community Care Facilitator <i>Professionals based in the local community to work with consumers as part of multidisciplinary team, to guide them on personalised services, information and supports to meet their needs</i> | Possibly, further discussion needed | Possibly, further discussion needed | | Possibly, further discussion needed |

The model has been continually adapted and refined as it matured, reflecting the realities of a genuine place-based partnership. This Pilot is unique in promoting a whole system approach, shared ownership and collaboration across community and primary care settings. Positions are hosted by local Shire Councils, the Hospital and Health Service, Royal Flying Doctor Service and local Aboriginal and Torres Strait Islander Community Controlled Organisations.

LEARNING

The local co-designed model's biggest success has been the Community Service Coordinators, who act as key contacts in the towns to direct and connect people with health services. A major achievement is creating service directories for each town, covering health, disability and aged care services.

The pilot is delivering tangible benefits by strengthening collaboration between health professionals to identify vulnerable community members and connect them with the right services. Early results also indicate a promising trend toward fewer hospital visits. Examples of specific local outcomes include:

- a 300% increase in monthly physiotherapy availability in Thargomindah.
- 150% increase in mammogram screening appointment attendance in Thargomindah provided by BreastScreen Queensland mobile service.
- Introduction of sleep studies (new service) in Quilpie and Thargomindah.
- In Charleville the Queensland Ambulance Service has integrated the service directory onto iPads, giving paramedics access to real-time referral information.
- Optometry service reintroduced in Thargomindah after 3-year absence.
- QR code to Quilpie service directory added to Council's Get Ready Queensland calendar.
- Local community surveys to identify health priorities and inform future planning and activities.

The independent external interim evaluation found:

- Most stakeholders report the pilot improves care and service coordination.
- True service gaps are highlighted and provides a process to address them.
- Stakeholder engagement of service providers varies; those highly engaged report greater satisfaction.

Key learnings include:

- Investment in building trust and commitment is critical to success.
- True co-design takes time and dedicated resources.
- Working collaboratively with partners and stakeholders requires clear communication and defined roles and responsibilities are essential.
- Leveraging existing partnerships is beneficial and acknowledge in-kind contributions.
- Leadership and willingness to innovate drive success.

The pilot offers a new integrated care model for people living with chronic conditions in remote communities by improving access to coordinated care close to home. It promotes shared ownership and collaboration across organisations and providers in the community and primary care setting.

IMPACT FOR PRACTICE

This approach provides a scalable and transferable model for empowering rural and remote health services to design and deliver sustainable, collaborative care in partnership with local communities.

By undertaking scoping and place-based co-design with stakeholders, the Pilot developed an overarching framework and site-specific model that align program objectives with local priorities. The interim evaluation (April 2024) highlighted key strengths of this approach:

- Established strong foundations, fostering local ownership of the model.
- Adopted an inclusive, tailored engagement strategy that ensured participation by stakeholders with appropriate decision-making authority and influence.
- Utilised a data-driven process to guide decision-making and build a clear strong understanding of local needs.

By starting small, thinking differently, and demonstrating measurable impact, this place-based methodology offers a replicable approach for rural and remote health service providers to co-create sustainable, integrated services that reflect the unique needs of their communities.

FUNDING

Funded by the Primary Care Pilot program through Department of Health, Disability and Aged Care

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A NURSING LEADERSHIP-DRIVEN COLLABORATIVE TO IMPROVE ACUTE COPD CARE: PRACTICE LESSONS FROM TEN VICTORIAN HOSPITALS

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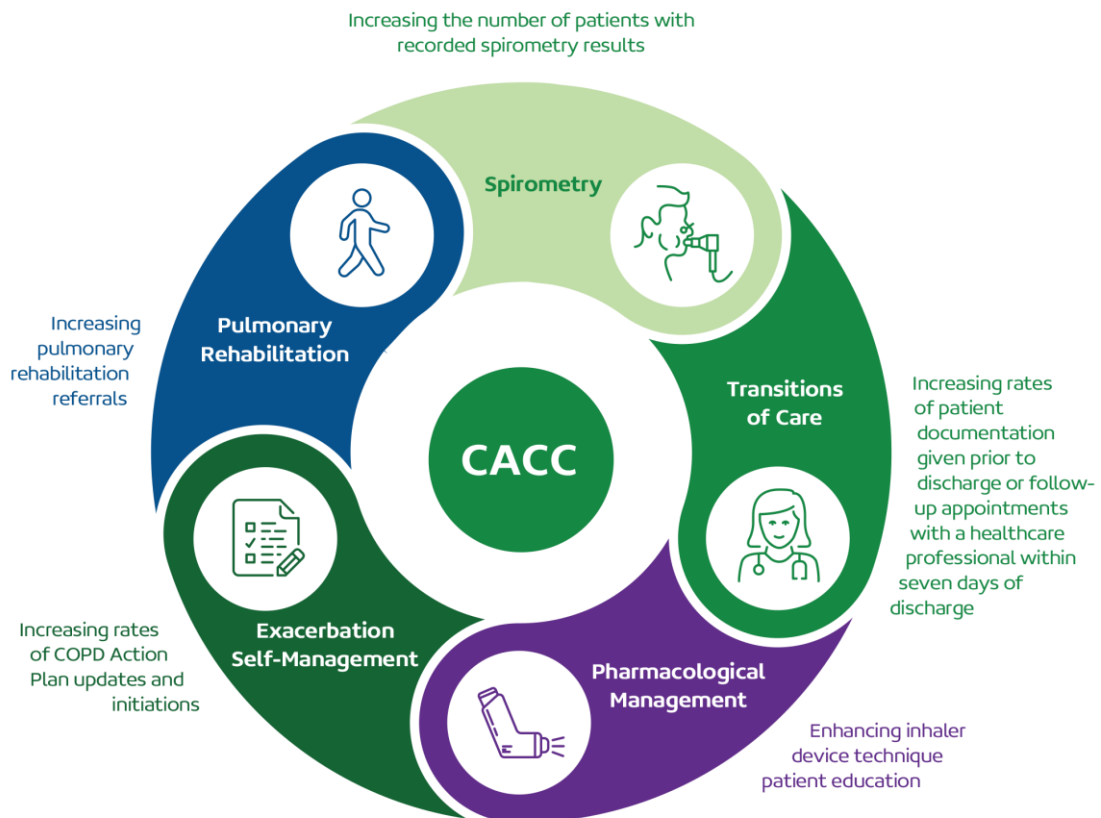
INTRODUCTION

Hospitals are increasingly focused on strengthening systems and workforce capability to deliver consistent, evidence-based care for people admitted with chronic obstructive pulmonary disease (COPD) to align with the COPD Clinical Care Standard [1]. Although national guidelines exist [1, 2], many health services continue to face challenges in translating these recommendations into routine practice [3]. Persistent difficulties in operationalising standardised processes, coordinating multidisciplinary teams, and developing workforce capability to reliably implement best-practice care contributes to ongoing variation in care delivery. These challenges highlight the need for system-level reform that strengthens leadership, reduces variation, and supports sustainable redesign.

The COPD Acute Care Collaborative (CACC) Project was delivered by Lung Foundation Australia (LFA) with support from Safer Care Victoria (SCV). The collaborative was formed by a group of ten Nurse Ambassadors working in acute care across ten Victorian hospitals. Each Nurse Ambassador was supported by an Executive Sponsor from their hospital to provide organisational leadership and guidance. Nurse Ambassadors led project activity within their local sites, performing quality improvement work, identifying and testing change ideas, auditing COPD care against the five quality-of-care indicators, and engaging multidisciplinary teams. LFA provided project management, data collection monitoring, a nurse educator, evidence-based resources, training and Ambassador support. SCV partnered with LFA to provide project governance and funding and supported Ambassadors through provision of improvement science resources and education. This project formed a part of SCV's broader 100,000 Lives Program.

Five quality-of-care indicators were used to guide focus areas (Figure 1), and iterative Plan-Do-Study-Act (PDSA) cycles informed the development of a COPD Acute Care Quality Improvement Toolkit, including three practical, downloadable resources. The quality-of-care indicators were increasing: the number of referrals to pulmonary rehabilitation, rates of COPD Action Plan initiation or updating, number of patients with documented spirometry results, inhaler device technique assessment, and rates of discharge information given or a GP follow-up made within 7-days of discharge.

FIGURE 1. FIVE QUALITY-OF CARE INDICATORS FOR THE COPD ACUTE CARE COLLABORATIVE PROJECT



Executive leadership proved central to progress, enabling alignment with adequate resourcing, and protected time for Nurse Ambassadors to lead change. The collaborative Nurse Ambassadors performed group problem solving, supported by LFA and SCV who strengthened workforce capability through coaching and learning workshops and evidence-based change management tools. PDSA cycles helped adapt interventions to local context and supported incremental staff behaviour and practice change. Challenges included data access, competing workload demands, and differing levels of organisational readiness.

The three toolkit resources (Figures 3, 4, & 5) offer transferable, scalable solutions to support ongoing improvement in the acute care of COPD across Australia. This initiative was undertaken as a quality improvement activity and did not require ethics approval.

PROBLEM / ISSUES

There is growing recognition among hospitals that system-level approaches are essential to improve acute care for chronic conditions. The burden of COPD, one of Australia's leading preventable causes of hospitalisation (4), demonstrates why these approaches are needed. Variation in care practices across acute health services reflects gaps in process standardisation, multidisciplinary coordination, and capability to sustain quality improvement. Managers are challenged to translate evidence and national standards into operational workflows while simultaneously addressing competing priorities, staff turnover, and limited access to reliable data.

Across the ten participating hospitals, baseline consultation revealed inconsistent admission and discharge processes for COPD, potential to optimise multidisciplinary integration, and variable confidence among frontline staff in using improvement science. These capability gaps, together with system fragmentation indicate the need for a structured, leadership-driven redesign initiative.

INTERVENTION / APPROACHES

LEADERSHIP-DRIVEN MODEL

Each participating site nominated an Executive Sponsor to act as a senior change champion and a Nurse Ambassador to lead local practice change. This pairing created a vertical leadership structure that aimed to support organisational alignment while empowering frontline workers to have ownership of the change initiative. LFA approached the project by holding a mix of face-to-face orientation workshops, three learning workshops, a summative event and fortnightly drop-in sessions with guest-speakers aligned to topics requested by Nurse Ambassadors. An expert reference panel consisting of expert COPD clinicians and stakeholders helped to design the project, timeline and the five quality-of-care indicators. This ensured the project strongly reflected the current evidence that supports reduction in avoidable readmissions, to achieve better care for people living with COPD in Victoria.

WORKFORCE CAPABILITY BUILDING

Nurse Ambassadors recruited multidisciplinary healthcare professionals - including nursing, pharmacy, medical, physiotherapy, administration, and digital health teams - to co-design solutions that address inconsistent care of acute COPD management. Across participating hospitals, best practice care of COPD became a regular agenda item in meetings, ward rounds, and safety huddles. Nurse Ambassadors delivered targeted training on inhaler technique, COPD Action Plans, and spirometry, and displayed project information on the ward for visibility and reminders. This approach strengthened local capability, engaged the wider clinical team and laid foundations for sustained improvements beyond the pilot. LFA provided education to Nurse Ambassadors about managing and interpreting data, establishing teams, using COPD assessment tools, utilising the LFA Respiratory Nurse program, and techniques to optimise staff education techniques. Nurse Ambassadors contributed feedback and guidance for the Multidisciplinary Checklist to ensure applicability across all hospital areas mentioned in the COPD Clinical Care Standard. Education sessions on Quit services and training provided support for nicotine cessation conversations. SCV provided education on the psychology of change and LFA supported conversations with Ambassadors about applying this to specific clinical challenges experiences across sites. SCV also provided expertise and training in the Model of Improvement and the Quality Improvement Toolkit ([5]).

IMPROVEMENT SCIENCE IN PRACTICE

Thirty-five PDSA cycles were undertaken by Nurse Ambassadors to test the feasibility of quality improvement initiatives suited to diverse acute clinical environments – from small regional hospitals through to large metropolitan hospitals. Examples included integrating inhaler device technique assessments into existing workflows, using reminders and checklists, improving access to printed patient education materials, refining discharge information packs, automating a daily COPD admission list to prompt timely review by Respiratory Clinical Nurse Consultants and use of iPads to demonstrate videos for inhaler use. These iterative cycles assisted to identify practical solutions while reducing the resource burden of large-scale change. PDSA Cycles were reviewed with the Nurse Ambassadors and LFA, with feedback provided to optimise impact at a broader system level and across different clinical settings, underpinned by SCV's suite of resources and expertise.

FIGURE 2. FIVE COPD ACUTE CARE COLLABORATIVE PROJECT CHANGE ENABLERS



TOOLKIT DEVELOPMENT AND RELEASE

Learnings from the Nurse Ambassador collaborative informed the development of the COPD Acute Care Quality Improvement Toolkit, which includes three freely available resources designed to support consistent, scalable COPD care.

FIGURE 3. MY COPD HOSPITAL STAY CHECKLIST: WHAT TO KNOW AND ASK

My COPD Hospital Stay Checklist: What to know and ask



This checklist is for people with chronic obstructive pulmonary disease (COPD) who are in hospital for a flare-up (also called an exacerbation). It helps you, your family and support people understand the care you should receive, the questions to ask before you go home, and simple steps to help you keep getting better at home.

Use it like this:

Tick the box if it has been done

If not, ask the question shown



Before I go home

Understanding my condition

Knowing about your COPD can help you manage it better.

- I understand what COPD is and how it affects me
- My healthcare team has explained my condition in a way I understand
- I know where to find more help or information

Ask

Can you explain COPD again in simple terms or give me information I can read at home?

Breathing test (spirometry)

Spirometry is the only way to diagnose COPD. You should have had this test before, or be referred for a test after you leave hospital.

- I have had a spirometry test before or during my stay
- I have been referred for spirometry after I go home

Ask

Have I had a spirometry test to confirm my diagnosis of COPD? If not, can you refer me for one?

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Patient activation checklist supporting engagement and discharge readiness.

FIGURE 4. COPD MULTIDISCIPLINARY CARE CHECKLIST TEMPLATE

COPD Multidisciplinary Care Checklist Template

This form requires completion by the multidisciplinary team, including medical, nursing and allied health staff, aligning with the COPD Clinical Care Standard¹ and The COPD-X Plan: Australian and New Zealand Guidelines for the Management of Chronic Obstructive Pulmonary Disease².

Hospital Admission for COPD Exacerbation

Patient Name: _____

DOB: ____/____/____

URN: _____

Address: _____

In Hospital

Task: Smoking/vaping cessation support

Record smoking/vaping status for tobacco or other substances, offer cessation advice (Ask, Advise, Help model), pharmacotherapy, and referral

Yes
 No
 Declined
 N/A
 Quitline referral
 NRT offered

Comments: _____

Sign: _____ Designation: _____ Date: ____/____/____

Task: Inhaler technique assessment

Assess and document inhaler technique, provide further education and assessment if required

Competent
 Needs follow-up
 Declined
 N/A

Comments: _____

Sign: _____ Designation: _____ Date: ____/____/____

Task: Pharmacist medication review

Review current medications and provide education on correct use and inhaler device technique

Yes
 No
 N/A

Comments: _____

Sign: _____ Designation: _____ Date: ____/____/____

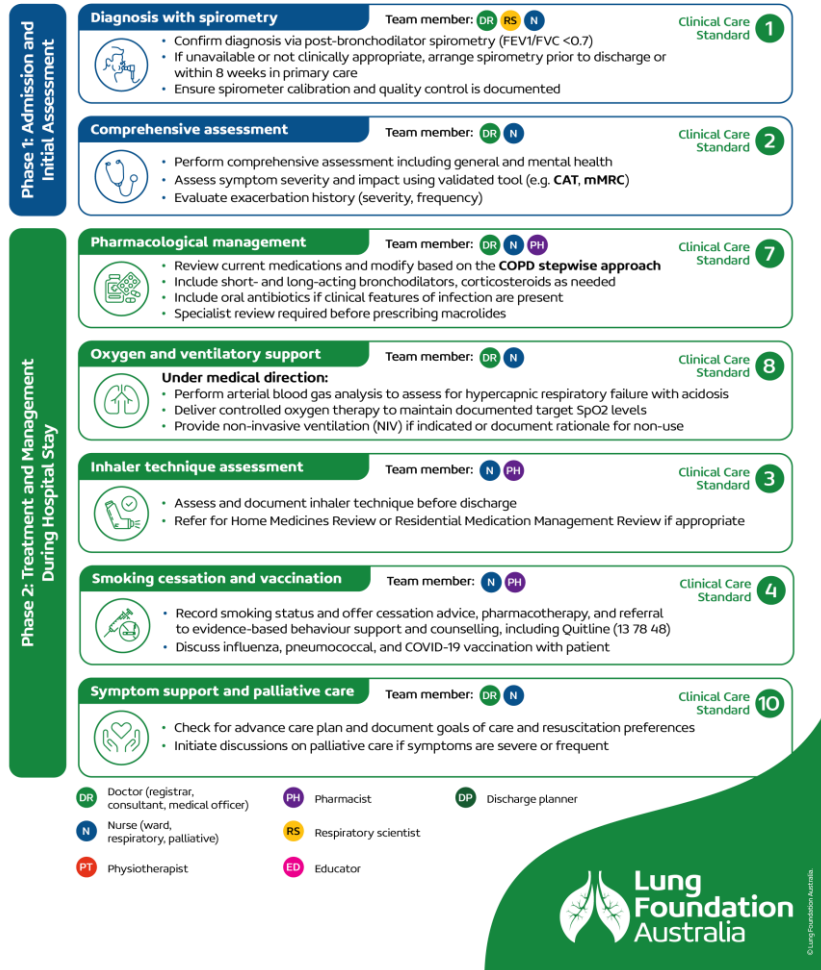
Task: Spirometry referral or assessment**Task: Oxygen therapy / NIV documented**

A tested system for whole-team documentation and consistent assessment and planning.

FIGURE 5. COPD STANDARD OPERATING PROCEDURE TEMPLATE

COPD Standard Operating Procedure Template

This procedure outlines a standardised, evidence-based pathway for in-hospital management of COPD exacerbations, aligned with the **COPD Clinical Care Standard¹** and **The COPD-X Plan: Australian and New Zealand Guidelines for the Management of Chronic Obstructive Pulmonary Disease²**. It provides steps for admission, treatment, and discharge to support consistent, high-quality care and continuity post-hospitalisation. Each patient should be individually assessed, as COPD presentations vary widely in disease type, comorbidities, and social circumstances, and care should be guided by an individualised treatment plan.



Standardised acute-care pathway aligned with evidence-based guidelines, for adaptation at prospective hospital sites wanting to improve COPD care.

These tools and the COPD Acute Care Quality Improvement Toolkit are available for free download from the Lung Foundation Australia Resource Hub.

LEARNING

LEADERSHIP AS AN ENABLER OF REDESIGN

Executive Sponsors played a pivotal role in prioritising improvement in COPD management, removing system-level barriers, and ensuring the project was aligned with organisational priorities. Their influence reinforced the value of Nurse Ambassadors and helped embed changes into routine practice.

WORKFORCE CAPABILITY AND CULTURE

Nurse Ambassadors reported strengthened confidence in improvement science and greater confidence to coordinate change across the multidisciplinary team. Staff narratives highlighted improvements in communication, patient

engagement, and self-management support. The initiative demonstrated that investing in frontline leadership capability can positively influence culture and alignment with best-practice care.

PRACTICAL LESSONS FOR MANAGERS

Key lessons include the value of protected time for frontline leaders, the impact of cross-site learning in accelerating solutions, and the importance of accessible data for monitoring progress. Small PDSA cycles proved effective for adapting interventions to local contexts.

IMPACT FOR PRACTICE

A positive change was observed across many the quality-of-care indicators within a pilot context. Improvements included increased inhaler technique assessment, greater use and review of COPD Action Plans, a greater number of referrals to pulmonary rehabilitation, and improved hospital discharge documentation. Participating sites also reported anecdotal improvements in patient experience through better patient education and shared decision-making.

The toolkit developed through the collaborative, offers practical, adaptable resources for health services seeking to improve acute COPD care. These tools can support improved standardisation of care in the acute setting, aligned with evidence-based national standards. Broader dissemination of the toolkit and resources could enable scalability beyond the initial ten hospitals in other Victorian hospitals, or other States and Territories.

FUTURE DIRECTION

Future opportunities include testing and implementing the toolkit within additional health services, extending improvement activities to emergency departments and community settings, and establishing a COPD community of practice to foster ongoing collaboration and maintain momentum.

FUNDING

Funded by Safer Care Victoria

CONFLICTS OF INTEREST

None

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THE CEO EXPERIENCE IN VICTORIAN PUBLIC HOSPITALS: CHALLENGES AND STRATEGIES FOR LEADERSHIP STABILITY

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ABSTRACT

Leadership stability is increasingly recognised as critical to hospital performance and reform continuity, yet CEO turnover in healthcare is among the highest globally. In Victoria, where public hospitals operate under devolved governance but central accountability, leadership disruption risks slowing reform and weakening system confidence. This study explored what attracts, retains and develops Victorian public hospital Chief Executive Officers (CEOs), beginning with an appreciative inquiry into what helps them succeed. Sixteen CEOs, representing 21% of the cohort across metropolitan, regional and rural services, participated in confidential interviews in late 2024. A brief pulse survey in March 2025 provided additional context during early implementation of Local Health Service Networks (LHSNs). Analysis identified five recurring tensions shaping the CEO experience: performance expectations without structured onboarding; departmental relationships characterised by reactive engagement; governance that can enable or destabilise; leadership development confined to silos rather than system-wide; and reform ambitions that outstrip local capacity. Addressing these five system-level tensions through structured onboarding, trust-based relationships, governance capability, coordinated leadership pathways and realistic workload settings would strengthen leadership stability, reform delivery, retention and system performance.

KEYWORDS

Leadership Stability, public hospital, challenges

INTRODUCTION

Stable and capable executive leadership underpins hospital performance, workforce confidence and reform continuity, with evidence linking leadership quality to organisational outcomes and patient safety. [1-3] When a Chief Executive Officer (CEO) role turns over, strategy pauses, culture unsettles and implementation slows. CEO turnover is increasing worldwide, with health-sector turnover among the highest of any industry. [1,2] Leadership instability therefore poses a strategic risk to healthcare systems reliant on experienced executives to hold together clinical operations, governance and community relationships.

Contemporary health services face increasing complexity, workforce fatigue, reform intensity and heightened public scrutiny, all of which amplify the challenge and importance of leadership stability. Hospitals led by effective, long-tenured CEOs show stronger alignment between clinical and organisational priorities, more coherent culture and steadier performance over time. [2,3]

Victoria's public hospital system is one of the most devolved yet centrally influenced in Australia. Each of the state's 76 public health services is governed by an independent Board that appoints its CEO, while policy direction, funding and oversight remain the responsibility of the Department of Health. This dual accountability means CEOs balance local autonomy with central control, often across competing expectations.

The 2024 Health Services Plan acknowledged that these arrangements were "no longer fit for purpose" and recommended strengthened coordination through new system structures.[4] Hospitals Victoria and 12 Local Health Service Networks (LHSNs) were subsequently established to improve collaboration without removing hospital independence. Their success depends on sustained leadership capability and mutual trust between CEOs, Boards and the Department.

The study began with an appreciative intent—to understand what helps Victorian public hospital CEOs succeed in complex environments and identify the system conditions that influence effectiveness, development and sustainability. The analysis builds on *The CEO Experience* report (April 2025),[5] which distilled these insights into five recurring tensions that together define the leadership environment. The study aims to inform practical improvements to the conditions that enable CEOs to perform and stay.

METHODS

All 76 Victorian public hospital CEOs were invited to participate in confidential, semi-structured interviews. Sixteen (21%) agreed, representing metropolitan (25%) and regional or rural (75%) services and reflecting the geographic spread of Victorian public hospitals. Participants included first-time and experienced CEOs from nursing, allied health and finance backgrounds.

The one-hour interviews were conducted by the author via Zoom between August and November 2024. An interview guide was circulated beforehand, covering attraction, retention and development factors. Interviews were recorded with consent and transcribed.

A brief pulse survey in March 2025 captured early impacts of LHSN implementation on CEO workload, priorities and tenure intentions. It was added to provide timely context on leadership conditions following the policy announcement that occurred after interviews had concluded. Fifteen CEOs responded, reflecting a similar metropolitan and regional-rural distribution to the interview sample.

ANALYTICAL APPROACH

To protect anonymity, transcripts were numbered and de-identified before analysis. They were then read multiple times and coded manually by the author. Initial codes followed the interview-guide domains of attraction, retention and development. Additional codes for Board governance and Department relationships were created during analysis in response to their frequent emergence in the data.

The author initially drafted the report with extensive quotations to preserve participant voice, then reduced the number to improve readability while retaining meaning. Percentages are used to indicate prevalence without implying statistical generalisation.

RESEARCHER POSITION AND ETHICS

The author is an executive coach and organisational psychologist with prior research-leadership experience. The study was conducted independently and unfunded. CEOs participated in their professional capacity. No patient or clinical data were collected. Formal ethics approval was not required. Participants received a copy of the report for comment prior to publication to confirm accuracy and that their anonymity had been preserved. None requested changes.

FINDINGS

Five recurring tensions shaped the CEO experience and together influenced attraction, development and retention (Figure 1). All CEOs managed these tensions, to a greater or lesser degree and often at the same time. Together, they define the practical conditions shaping how CEOs lead, develop and remain in their roles.

FIGURE 1. THE FIVE TENSIONS SHAPING THE CEO EXPERIENCE OF VICTORIAN PUBLIC HOSPITAL CEOs



ONBOARDING: PERFORMANCE PRESSURE VS SUPPORT GAPS

CEOs described entering demanding roles with immediate performance expectations but no formal onboarding. Many recounted steep learning curves, ambiguous expectations and early isolation.

“My first year as a newly appointed chief executive—that was tough.” Another recalled being promised mentoring *“that never materialised.”*

Without clear induction, new leaders had to self-navigate complex governance, funding and departmental relationships. The adjustment period created a six-to-twelve-month lag in effectiveness just as strategic alignment was most critical. Even experienced second- or third-time CEOs described needing to relearn the system's informal rules. *“I can't tell you how many times I wished someone had just sat me down in the first week and explained how things actually work here.”* Peer networks helped but varied in reach and timing. Structured orientation to key relationships, departmental processes and governance expectations was viewed as essential to shorten adjustment and reduce strain.

DEPARTMENT RELATIONSHIP: WANTING PARTNERSHIP VS FEELING MANAGED

Relationships with the Department of Health were regarded as essential, but collaboration was inconsistent. While some engagement was constructive, much of it was described as reactive or directive.

Many said consultation came late, after key decisions, leaving their expertise underused. *“There’s so much wisdom sitting around the table, sitting there and saying nothing.”*

Frequent data requests and shifting expectations diverted attention from strategy and added to administrative burden. For smaller and rural services, this was especially acute: *“Everything is treated as a priority, and the work is packed on, packed on, packed on.”*

CEOs also cited uneven communication—*“It feels like the left hand doesn’t know what the right hand is doing.”*—and described performance reviews led by staff without sufficient contextual understanding.

Despite frustration, most expressed a desire for calmer, more collaborative engagement that would enable earlier dialogue, reduce rework and build trust between the Department and health service leaders.

GOVERNANCE: BOARDS AS ENABLER VS GOVERNANCE RISK

The Chair–CEO relationship was critical for both effectiveness and tenure. Seventy-five percent of CEOs described supportive Chairs and capable Boards that offered constructive challenge and trust. *“I feel just so, so lucky to have landed this role with a Board Chair where we work so well together.”*

At their best, Boards provided clarity, mentoring and measured oversight. *“They challenge and stretch you, but they’re generous and kind.”*

However, the remaining quarter experienced difficult dynamics. *“A bad Board can do you in—and vice versa.”* When roles blurred or relationships soured, CEOs diverted energy from strategy to managing process and politics.

A recurring difficulty, particularly for first-time CEOs, was addressing interference without jeopardising relationships. As one experienced leader observed, *“It’s hard when the Chair wants to take on an executive role but you don’t have the authority to say, ‘This is my side of the fence.’”*

Board turnover compounded these challenges. CEOs, particularly in rural services, often had to orient new metropolitan appointees to local realities—distance, staff shortages and community expectations—adding to workload and tension.

LEADERSHIP PIPELINE: DEVELOPING LEADERS SYSTEM-WIDE VS IN SILOS

All CEOs saw themselves as responsible for developing successors, but pathways into CEO roles were fragmented and inconsistent. Unlike clinical careers with defined training progressions, aspiring executives relied on chance, informal mentoring and individual study—postgraduate programs, governance courses or short leadership intensives.

Some organisations had comprehensive succession plans, while others relied on acting arrangements or external recruitment. *“None of the directors are going to be automatically ready to take on these big jobs because they’re not being prepared for it.”*

Leaders supported the idea of a public-hospital-specific development pathway combining mentoring, coaching and system exposure. *“It’s not about grooming them to be anything like me—it’s about helping them be the best version of who they are.”*

Most agreed that leadership development was a shared responsibility, but one that cannot be delivered consistently without central coordination or dedicated resourcing.

SYSTEM REFORM AND CAPACITY: SYSTEM AMBITION VS LOCAL IMPACT

CEOs supported the intent of system reform but said implementation had increased workload without adequately considering administrative capacity, particularly in smaller rural services.

The March 2025 pulse survey found that 53% of respondents were working four or more additional hours weekly. To absorb this, 60% reported working longer days and weekends, while just over half (53%) were spending less time on core service priorities or supporting their executive teams.

Impacts were most acute for country CEOs, 64% of whom said their core responsibilities were affected and 64% planned to leave sooner than previously intended.

One CEO summed up the strain: *"We support the intent, but it has to be doable."* The issue was not resistance to collaboration but structural reality—many rural CEOs manage everything from strategic planning to facility maintenance within tight resources. System reforms that overlook administrative capacity risk undermining the very sustainability they seek to achieve.

DISCUSSION

The findings show that leadership continuity in Victoria's public hospitals depends less on individual capability than on surrounding conditions. The five tensions identified illustrate how structural and relational settings shape attraction, development and retention. These are system effects rather than reflections of individual capability. They highlight opportunities to strengthen system performance through more deliberate support for CEOs.

INTERPRETING THE FINDINGS AND THEIR IMPLICATIONS

CEOs described strong purpose and public-service motivation, yet that commitment is tested by inconsistent onboarding, variable governance practice and reactive communication with the Department. These dynamics affect how long leaders stay and how effectively they operate.

The tensions reveal a need for greater coherence in how the system manages executive leadership. Current arrangements rely heavily on each CEO's experience and networks; when these are strong, performance is high, but when they are not, pressures erode confidence and continuity. Predictable structures for onboarding, feedback and development reduce this variability.

Together, the five tensions show how leadership sustainability functions as a feedback mechanism within the system. When CEOs are well supported, knowledge and relationships compound, creating organisational learning that accelerates reform. When turnover or strain disrupts that continuity, the system must continually relearn what it has already solved. Designing structures that preserve this relational and institutional memory is therefore both a workforce and a reform imperative.

IMPLICATIONS FOR SYSTEM PRACTICE

Addressing the five tensions requires deliberate system design rather than individual adaptation. Strengthening leadership conditions requires coordinated attention to several levers:

- **Structured onboarding:** A six- to 12-month learning curve is inevitable as CEOs experience the annual cycle, but it need not involve a lag in effectiveness. Clear briefings, relationship mapping, governance orientation and mentoring can accelerate alignment and confidence for new CEOs.
- **Trust-based Department relationships:** Clearer communication channels, realistic timelines and earlier consultation improve decision quality and reinforce mutual respect. Recognising differences in capacity across hospitals, particularly smaller and rural services, is essential.

- **Governance capability:** Well-inducted Boards and skilled Chairs help maintain boundaries and constructive challenge. Peer learning among Chairs and access to neutral facilitation when difficulties arise can preserve focus on strategy.
- **Leadership pathways:** Visible, system-wide development pathways and targeted learning in governance, system navigation and influence would strengthen the leadership pipeline.
- **Capacity for collaboration:** Reform initiatives should account for workload differences and provide temporary project relief or flexible resourcing to prevent system priorities from displacing local obligations.

SYSTEM LEARNING AND ENGAGEMENT

Between June and November 2025, findings from *The CEO Experience* were presented to the Minister for Health's office and the Department of Health. [6] The briefings focused on practical, low-infrastructure responses to strengthen leadership capability. The work is now at an early planning phase, and these findings have contributed to Departmental discussions on workforce and leadership planning.

LEADERSHIP CONTINUITY AND SHARED RESPONSIBILITY

Leadership continuity shapes how well hospitals absorb and recover from inevitable change. When induction, governance and relationships are managed consistently, new CEOs find their footing more quickly and services maintain momentum. When supports are inconsistent, performance relies on individuals filling gaps rather than on system structures that make continuity easier.

RELATIONSHIPS AND SYSTEM PERFORMANCE

Relationships are the foundation of system effectiveness. Public hospital CEOs work within interdependent networks where outcomes rely on how well organisations connect, not on individual effort. Constructive relationships between CEOs, Boards and the Department enable coordination and reform; when they fracture, pressures intensify. The findings highlight relational conditions—role clarity, mutual respect and consistent communication—that strengthen the system as a whole.

CONTRIBUTION TO THE LITERATURE

This study contributes to the literature by applying an appreciative lens to examine what enables and constrains leadership effectiveness within a devolved health system. By focusing on the conditions that help CEOs succeed rather than only the challenges they face, it offers a constructive systems perspective on executive sustainability.

LIMITATIONS

This research captures the perspectives of 16 CEOs and a 15-respondent pulse survey and findings should be interpreted as indicative rather than representative. The study reflects CEOs in role during 2024–25 and may not apply to future contexts or other jurisdictions. Perspectives from Department of Health staff, Board Chairs and members, former CEOs, and clinical and non-clinical employees were outside scope but would add further depth in future work. Longitudinal evaluation of initiatives targeting the leadership conditions identified in this study would help determine which approaches most strengthen leadership sustainability.

CONCLUSION

Victorian public hospital CEOs bring deep expertise and commitment to public service. They describe demanding work shaped by structural and relational conditions that can be improved. Addressing these conditions—onboarding, departmental relationships, governance practice, leadership pathways and collaboration capacity—offers a practical route to greater stability and stronger attraction to the role to help ensure the position continues to draw high-calibre candidates.

Leadership sustainability is a form of organisational capability. It supports institutional memory, relational trust and the continuity of learning that underpins effective reform. When these conditions are in place, CEOs can operate with greater

confidence and adaptability, and their experience compounds within the system rather than being lost through turnover. Sustaining that capability is essential to performance and public value.

Structured onboarding, trust-based engagement and governance clarity help maintain this continuity of learning and performance. In a sector where turnover is high, [1,2] improving the CEO experience is not about additional support for individuals; it is about creating the environment in which capable people want to lead, can lead effectively, and stay long enough to make a lasting difference.

CONFLICT OF INTEREST

The study was undertaken independently and without external funding. The author provides executive coaching and organisational psychology services to senior leaders and organisations, but had no coaching or advisory work with any participating organisation during the research. The author may consider future opportunities to support implementation or leadership development initiatives arising from this study.

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THE FUTURE OF ACCREDITATION: WHAT'S NEXT FOR HOSPITALS

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EXECUTIVE SUMMARY

Accreditation has played a critical role in strengthening safety and quality across Australia's hospitals since the introduction of the NSQHS Standards in 2013. [1] Over this time, hospitals have increasingly relied on accreditation not only as a compliance requirement but as a framework for cultural and system-wide improvement. The health system continues to evolve rapidly, with digital technologies, regulatory changes, increased transparency expectations and more complex care pathways reshaping how care is delivered.

These shifts imply the need for accreditation to continue evolving. This brief outlines emerging directions for hospital accreditation in Australia and identifies opportunities to further support continuous, consumer-centred and digitally enabled care.

PROBLEM/ISSUES

Accreditation has long underpinned safe, high-quality care, yet the environment in which health services operate is changing rapidly. Digital disruption, evolving regulatory expectations and the growing influence of patients and communities are redefining how care is delivered and measured.

The health system is becoming more interconnected, with multiple frameworks spanning tertiary and specialist care, mental health, primary care, aged care, paediatrics and imaging. This broader ecosystem is driving the development of modules and approaches that better reflect the diversity of service delivery across Australia.

Expectations are also shifting towards continuous assurance. With real-time data increasingly available and risks emerging more dynamically, health services are moving away from periodic preparation cycles towards models that emphasise ongoing visibility of performance and everyday readiness. While the maturity of electronic medical records, dashboards, feedback platforms and safety systems varies across services, these tools provide growing opportunities for accreditation processes to draw on live information and automated insights.

Patients and communities are likewise reshaping expectations, with greater emphasis on transparency, cultural safety and lived experience driving a stronger focus on person-centred care and meaningful consumer partnership.

Workforce capability and sustainability continue to influence engagement with accreditation, with new approaches to digital learning, micro-credentialling and skill development emerging across the sector.

Together, these shifts reflect a broader evolution in health care, one where accreditation must align with a system that is more digital, interconnected and centred on people. These trends mirror international observations, with recent ISQua-supported reviews highlighting the global evolution of accreditation systems and the increasing focus on contemporary models of care. [2]

INTERVENTION/APPROACHES

Across Australia and globally, several developments are influencing how hospital accreditation may likely evolve in the years ahead.

REAL-TIME, DATA-DRIVEN ACCREDITATION

Continuous monitoring through EMRs (Electronic Medical Records), patient platforms and safety dashboards is shifting accreditation from periodic review to ongoing assessment. Real-time insights support earlier risk detection, timely action and clearer visibility of improvement. Digital workflows further reduce administrative burden, with evidence generated as a by-product of care and progress tracked in real time.

ARTIFICIAL INTELLIGENCE(AI) -ASSISTED SELF-ASSESSMENT AND PREDICTIVE AUDITING

AI will be increasingly explored as a tool to support accreditation through evidence collation, pattern recognition and early identification of potential non-conformances. While automation can reduce administrative burden, human judgement will remain essential, with AI augmenting rather than replacing staff.

PERSON-CENTRED AND CO-DESIGNED STANDARDS

There is growing emphasis on embedding consumer and community input in the development and review of accreditation standards. Co-design approaches promote culturally safe, person-centred and equitable care by ensuring lived experience informs quality expectations. As digital platforms become more integrated into accreditation processes, accessibility and inclusivity will be critical.

INTEGRATION OF ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) MEASURES

Accreditation systems are increasingly incorporating measures related to sustainability, workforce wellbeing and data responsibility. As hospitals face climate, social and workforce pressures, ESG integration provides a consistent mechanism for evaluating organisational impact. [3]

MODULAR AND FLEXIBLE PATHWAYS

Modular accreditation pathways allow services to follow assessment approaches aligned to their size, scope and context. This benefits hospitals as well as community-based, smaller or digital-first providers requiring tailored processes. Existing modules, including those for clinical trials, aged care and ambulance services, demonstrate how accreditation is adapting to diverse service types and emerging models of care. [4,5]

INTEROPERABILITY AND WHOLE-OF-SYSTEM ASSESSMENT

Hospitals increasingly operate as part of larger networks of health and social care providers. Accreditation that examines integration, referral pathways, shared governance and accountability will determine how health services operate within their network, to provide genuine connected care for patients.

GAMIFIED, CONTINUOUS LEARNING FOR WORKFORCE DEVELOPMENT

Micro-credentialling and gamified learning platforms are emerging as accessible ways to build routine workforce capability. These approaches help embed quality and safety principles into everyday practice rather than limiting engagement to scheduled accreditation cycles.

LEARNING

Several key lessons emerge from these evolving directions. First, accreditation is shifting toward a model that supports continuous improvement rather than episodic assessment. This requires hospitals to embed systems that enable real-time monitoring and responsiveness, rather than relying on periodic preparation.

Second, consumer partnership must be more deeply integrated into accreditation models. Patient voice, cultural safety and equitable access are fundamental to modern care and should remain central to future standards.

Third, digital capability is critical. Hospitals need systems and skills that allow data to be used meaningfully for reporting, predictive insight and ongoing improvement. Digital transformation should not sit alongside accreditation, it must develop into a core enabler of safe, high-quality care.

Finally, these shifts reinforce that quality and safety cannot be addressed in organisational silos. Accreditation must recognise the interconnected nature of care delivery and support system-level collaboration and governance.

IMPACT FOR PRACTICE

The future of accreditation presents opportunities for hospitals to strengthen continuous readiness, improve patient outcomes and modernise quality systems. Investing in digital infrastructure, automation and data-driven monitoring, hospitals can reduce administrative burden and enhance responsiveness to emerging risks.

Embedding consumer partnerships and cultural safety practices will help services meet rising expectations for transparency and equity. Workforce capability can be strengthened through micro-credentialling, gamified quality improvement and real-time learning platforms that support accreditation-aligned practice.

The growth of modular, flexible and system-level accreditation pathways will enable services to demonstrate excellence in ways that reflect their size, context and model of care, while maintaining alignment with core national standards.

By embracing these shifts, hospitals can position accreditation as a powerful tool for innovation, integration and safe, high-quality care, every day, not just on assessment day.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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TAKING A RISK-BASED APPROACH IN ADAPTING CLINICAL GOVERNANCE SYSTEMS TO VIRTUAL CARE SETTINGS

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ABSTRACT

Virtual care is often assumed to be a straightforward substitute for in-person care, but this overlooks the unique risks and governance challenges associated with it. This paper examines how a risk-based approach can strengthen clinical governance in virtual care settings. Using established quality and risk management standards, we developed a tailored governance framework for a not-for-profit aged care provider. Key adaptations included modifying existing policies, creating a virtual care practice framework, and introducing clinical guidelines specific to remote delivery. A capability framework was designed to support clinicians, and a monitoring and evaluation system was implemented to ensure safety, quality, and accountability. These measures assure the governing body and demonstrate how structured governance can mitigate risks and improve outcomes in virtual care.

KEYWORDS

Virtual care, clinical governance, risk management, aged care

INTRODUCTION

The rapid expansion of telemedicine and remote patient monitoring during the COVID-19 pandemic transformed healthcare delivery, enabling access while reducing the risk of infection. It provided an alternative to patients who had difficulty in attending in person due to physical or geographical barriers. [1] Virtual care has also been associated with reduced healthcare costs and lower hospital admission rates in certain population groups, such as older adults. [2] However, virtual care is often perceived as a direct substitute for in-person care—a misconception that can lead to complacency in addressing its unique risks. Unlike traditional models, virtual care introduces challenges such as limited non-verbal communication, reduced opportunities for patient engagement, and potential breakdowns in clinical decision-making and data security. Research shows that patients frequently view remote consultations as less safe, citing concerns about interaction quality and continuity of care [3,4]

These issues highlight the need for robust clinical governance tailored to virtual environments. Governance frameworks must account for technology-driven risks, adapt clinical guidelines, and ensure accountability across diverse care settings. This paper explores how a risk-based approach, grounded in established quality and safety standards, can be applied to design and implement a customised clinical governance system for virtual care. Using the case of iAgeHealth, a virtual

platform developed by a not-for-profit aged care provider, this analysis demonstrates practical strategies for mitigating risk, supporting clinicians, and assuring safety and quality in virtual service delivery.

SETTING

McLean Care is a not-for-profit organisation delivering home and community care, residential care and independent living options to older Australians. McLean Care initiated the design and development of a clinical and allied health workforce solution, which was trademarked as iAgeHealth in 2023. The solution was co-designed with a range of experts, including the Aged & Community Care Providers Association, the CADET Virtual Reality Laboratory at Deakin University and Australian software development partners, Antero. The platform enables a virtual hub of clinicians, located anywhere in Australia, to receive immediate referrals to assess, diagnose, and monitor consumers in real-time. Consumer information is stored securely on the platform and is accessible to all treating clinicians. This supports a single longitudinal record for residents and shared care planning between the resident, GP, iAgeHealth clinicians, external specialists and aged care workers.

ANALYSIS OF THE ISSUE

The approach taken to assess the impact of virtual care in this setting involved applying known quality and risk standards and guidance. Standards and guidance for telehealth and virtual care services include ISO9001 (Quality management), ISO13131 (Telehealth quality guidelines), ISO7101 (Healthcare organisation management) and ISO3100 (Risk management). In this case study, the steps in the AS/NZS 3100:2018 risk management standard were applied as shown in Figure 1.

FIGURE 1. COMPONENTS OF THE AS/NZS RISK MANAGEMENT STANDARD 3100:2018 (STANDARDS AUSTRALIA)



The first step often overlooked in assessing a new or novel service is considering the scope and context of the service. A PESTLE analysis, adapted in healthcare to include a clinical domain (PESTLEC), was used to evaluate the context in all domains: Political, Economic, Social, Technological, Legal, Environmental, and Clinical. These risks were contextualised for the setting of this case study as shown in Table 1.

TABLE 1. RISK IDENTIFICATION IN VIRTUAL CARE (PESTLEC FRAMEWORK)

| Domain | Risk Issue |
|-----------|--|
| Political | Aged Care reforms requiring mandatory 24/7 Registered Nurse coverage |
| Economic | Redistribution of travel and waiting costs |

| Domain | Risk Issue |
|---------------|--|
| Social | Older population, often with sensory loss and technology adoption challenges |
| | Consumer expectations for transparency and quality of care. |
| Technological | Advances in technology affecting usability and service delivery. |
| | Virtual environment restricting clinical assessment and interaction quality. |
| | Altered multidisciplinary team dynamics affecting care coordination. |
| Legal | Regulatory requirements for accountability and safety |
| | Clinical decision support requiring adaptation and escalation criteria |
| | Scope of practice creep related to professional boundaries |
| Environmental | Connectivity in rural and remote areas |
| Clinical | Dependence on clinical judgment and empathy |
| | Shifts in service models with care delivered by consumers and non-clinicians |

Following further quantification of the risks in terms of frequency and likelihood, risk treatment and controls were applied in the development phases of iAgeHealth. To ensure a more systematic and proactive approach to managing these risks, iAgeHealth again engaged with Deakin University to develop and implement a clinical governance framework. Clinical governance approaches have been widely applied to cover the spectrum of risks that occur in healthcare delivery. In the iAgeHealth context, the starting point was the national model clinical governance framework produced by the Australian Commission on Safety and Quality in Health Care¹. The codesign process between Deakin and iAgeHealth worked through each element of the framework to determine how it could be adapted to ensure the quality, safety, and effectiveness of healthcare delivered through the virtual platform. Each of these domains is explored in the following sections.

GOVERNANCE, LEADERSHIP AND CULTURE

For iAgeHealth it was essential to distinguish between the staff employed by the facility receiving virtual care, family or caregivers at home, and the staff at iAgeHealth. It required clear articulation of roles and accountability. Table 2 outlines the various categories of staff and consumers who form part of the iAgeHealth delivery system.

TABLE 2. ROLES AND RESPONSIBILITIES FOR CLINICAL GOVERNANCE IN IAGEHEALTH

| Role | Context | Scope and accountability |
|---------------------------------|--|---|
| Consumers | Consumers and their families receiving virtual care | Consumers participate as partners to the extent that they choose and are able to engage. Consumers may be at home in a facility. |
| Support Workers | Staff employed by facilities, or family or carers at home for consumers receiving virtual care from iAgeHealth | Support workers work within the parameters defined within the clinical governance framework, according to their scope of practice, appropriate credentials and appropriate supervision. |
| iAgeHealth Support staff | Staff employed by iAgeHealth to support the delivery of virtual care | This includes staff who maintain the IT platforms, electronic medical records and manage any remote monitoring devices |
| iAgeHealth Clinicians | Clinicians employed by iAgeHealth to deliver virtual care | Registered Nurse 24/7, Nurse Practitioner, Physiotherapy, Occupational Therapy, Dietetics, Wound Care Consultant Clinician, Mental health worker. |

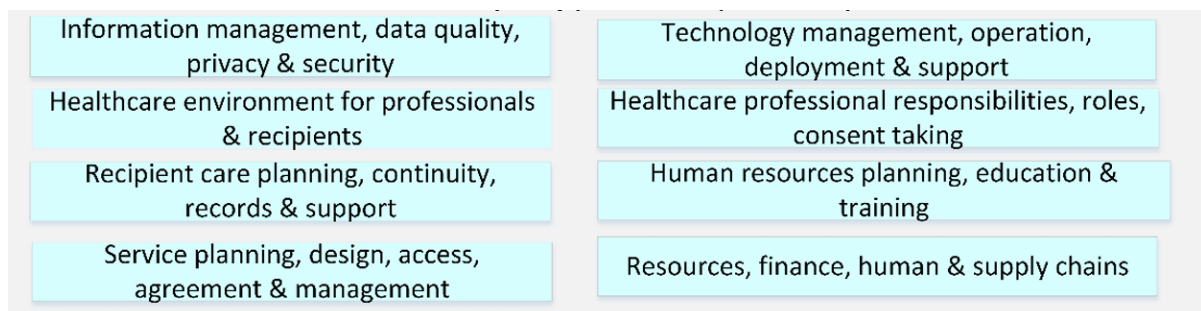
| | | |
|--|---|---|
| Non iAgeHealth Clinicians | Including GPs, pharmacists, community staff | Clinicians are responsible for liaising with iAgeHealth clinicians to support the provision of virtual care and to provide continuity of care |
| iAgeHealth Manager/ clinical lead | Responsible for ensuring that the systems that support the delivery of care are well designed and perform well | Clinical Nurse Consultant employed as clinical project lead and Nurse Practitioner as senior clinician to advise and inform the governing body, and to operate within the strategic and policy parameters endorsed by the governing body. |
| Governing Body | The governing body is ultimately responsible for ensuring that the iAgeHealth service is run well and delivers safe, high-quality care. | It does this by establishing a strong safety culture through an effective clinical governance system, satisfying itself that this system operates effectively, and ensuring that there is an ongoing focus on quality improvement |

This accountability approach was operationalised through publication of the framework, incorporation into position descriptions and staff training.

CONSUMER SAFETY AND QUALITY SYSTEMS

Best practice policy and procedures that clearly detailed roles and responsibilities were formalised and adapted from McLean Care guidance. Virtual care quality procedures were adapted to cover the elements covered in ISO 13131 as described in the guidance framework for telehealth and virtual care services produced by the International Medical Informatics Association (IMIA) [6] as shown in Figure 2.

FIGURE 2. VIRTUAL CARE QUALITY PROCEDURES (ISO 13131)



These included clinical risk management processes, incident management and complaints policies, information and security management policies and a range of human resources policies.

Critical to measuring and evaluating the impact of virtual care delivery was ensuring data could be easily collected, analysed, and reported. iAgeHealth had defined the information to be included in the consumer clinical record for the purposes of continuity of care, legislative requirements, accountability, research, education, evaluation, reporting, and funding. iAgeHealth can integrate with My Health Records and care management systems as well as electronic prescription and charting systems, creating a single source of accurate health information for each client. Being able to integrate this information in one place reduces the likelihood of duplication errors and their associated risks.

The reporting functionality of the Antero system was critical. During the initial development of the platform, several clinical pathway templates were integrated to provide guidance and documentation, particularly in the areas of falls and wound management. As the number and variety of consultations increased, episodes of care outside these pathways were classified as 'general' and included narrative text. Working outside a public health care system became challenging in terms of capturing meaningful clinical coding data. The Clinical Care Classification (CCC) System emerged from a research project conducted by a research team from 1988 to 1991 at Georgetown University School of Nursing [7] The

CCC System Framework links nursing diagnoses, nursing interventions, and nursing outcomes to describe a patient encounter. The terminologies are classified by 21 care components that link the diagnoses to interventions, to outcomes and to each other, as well as map their concepts to other health-related terminologies including SNOMED-CT, LOINC, ICNP and ICD-10. Building this clinical coding system into Antero resulted in iAgeHealth clinicians using defined clinical terms and diagnoses that could then be assigned to individual episodes of care.

iAgeHealth in collaboration with staff from Deakin University also developed a Monitoring and Evaluation framework based on earlier work [8] that contains a suite of safety and quality indicators covering qualitative and quantitative data to compare performance over time. Using the components of STEEP, developed by the Institute of Medicine [9], routine KPIs and evaluation metrics were identified in the 6 safety and quality domains shown in Table 3.

TABLE 3. IAGEHEALTH SAFETY AND QUALITY INDICATORS

| Domains | indicator | Measures |
|----------------|--|--|
| Safe | Number SAC1, SAC2, SAC3 Incidents resulting in harm | Issues with clinical assessment, diagnosis and treatment/handover/ communication/ documentation/ incorrect instruction provided, failure to followup, failure to escalate, missed consult, scheduling issue, delay, instructions not followed by service |
| | Number of transfers to higher level care | Detail of facility and reason for transfer |
| Timely | Timely access to MDT care | Time from referral to EOC – by facility and by professional group |
| | Time of treatment | Total EOC time by facility and by professional group |
| Effective | Care provided according to guidelines | EOC by clinical coding classification – total and by facility |
| | Clinical outcomes per procedure | Clinical outcomes by clinical coding classification – total and by facility |
| Efficient | Staff costs | Number of clinicians recruited Time and cost to recruit Time and cost to onboard iAgeHealth practitioners |
| | System performance / technical support | Number and types of technical issues Complexity and Time/ resources taken to resolve |
| Equitable | Gaps in service offering | Services requested not met by iAgeHealth Number of referrals escalated out Number of referrals not supported by iAgeHealth system due to the complexity of clinical need |
| Person-centred | Consumer experience | PREMS PROMS |

This data is compiled for reporting to the McLean Care governing body as part of a monthly clinical governance report by facility and for the entire iAgeHealth service.

CLINICAL PERFORMANCE AND EFFECTIVENESS

MacLean Care has an extensive library of policies and procedures that can be accessed by iAgeHealth clinicians. A number have been modified specifically for the virtual care environment. These include:

- Falls assessment and management
- Wound assessment and management
- Infection prevention and management

- Clinical Deterioration detection and response
- Emergency clinical response
- Escalation to primary care provider
- Referral and transfer of care
- Nurse initiated Medication management
- Clinical handover

Additionally, a range of resources is available as part of the adapted Virtual Care capability framework. The Clinical Care Standards published by the Commission on Safety and Quality in Healthcare also assist iAgeHealth to deliver appropriate evidence-based care and reduce unwarranted variation. Relevant standards include antimicrobial prescribing and the prevention and management of delirium. The Queensland Health Residential Aged Care Clinical Pathways [10] have also proved valuable in supplementing local guidance, particularly with respect to escalation of care.

The scope of virtual practice is currently limited to encounters that require only a history, gross inspection, and/or data that can be gathered with cameras and standard devices (e.g., glucometers, home blood pressure machines, thermometers, and scales). In practical terms, virtual care can be safely used in iAgeHealth to:

- assess and treat mental health issues
- assess and treat many skin problems using onsite cameras, including wound assessments
- assess and treat urinary, sinus and minor skin infections
- assess and treat conditions monitored with home devices and/or lab tests (e.g., hypertension, lipid management, thyroid conditions and some diabetes care)
- conduct any other assessments that do not require palpation or auscultation, including falls and frailty assessments.

The problems that are currently not amenable to virtual care include any new and significant emergency symptoms such as chest pain, shortness of breath and loss of neurologic function. [11] In this circumstance, the iAgeHealth clinician would escalate and enact the emergency clinical response protocol.

In terms of workforce capability and training, iAgeHealth employees have access to education and training programs to fulfil their role and responsibilities. This includes orientation to the organisation that is inclusive of mandatory training modules and training that is specific to the delivery of virtual care. This also includes ICT issue escalation protocols. The scope of clinical practice is monitored through daily handover meetings and service delivery records.

Additional guidance has been developed to strengthen workforce confidence and capability in delivering safe, high-quality virtual care. Building on the Skills for Health framework [12] commissioned by NHS England in 2022, iAgeHealth has adapted this model to create a streamlined set of capabilities tailored to the Australian context.

PARTNERING WITH CONSUMERS

A range of patient/ consumer outcomes are collected by iAgeHealth clinicians as part of assessment and treatment. Parameters such as blood pressure levels, cholesterol levels, and disease-specific markers are tracked to assess the impact of clinical interventions on the consumer's physiological health. Functional outcomes that measure the consumer's ability to perform daily activities are recorded in the clinical record. These include mobility, pain levels, and overall physical functioning.

iAgeHealth has also initiated the use of Patient-Reported Outcome Measures (PROMs) in obtaining direct feedback from patients regarding their symptoms, quality of life, and overall well-being. The EQ- 3D [13] was chosen as a tool, based on prior clinician experience and simplicity. This tool is used for consumers with long-term care needs who require multiple episodes of care. It allows self-assessment in the 5 domains of mobility, self-care, usual activities, pain/discomfort and anxiety/ depression.

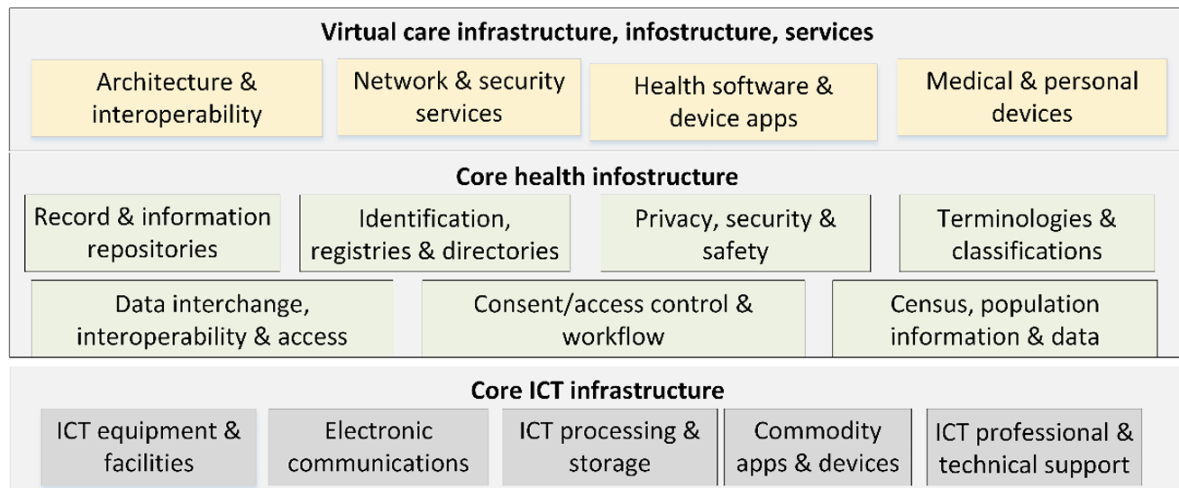
In terms of Patient-Reported Experience Measures (PREMs), iAgeHealth has adapted the Australian Hospital Patient Experience Questionnaire Set (AHPEQS), developed by the Australian Commission on Safety and Quality in Health Care.[14] The AHPEQS questions ask patients to consider short statements about events that occur during health care. The survey is provided by QR code at the end of the consultation and is shown in Table 4.

TABLE 4. IAGEHEALTH PREMS SURVEY

| Survey Question | Never | Sometimes | Often | Always |
|--|-------|-----------|-------|--------|
| Were iAgeHealth staff polite and welcoming? | | | | |
| Did iAgeHealth staff explain things to you? | | | | |
| Did you feel confident in your treatment and virtual care? | | | | |
| Were you involved in decisions about your virtual care? | | | | |
| Were your cultural or religious beliefs respected by iAgehealth staff? | | | | |

SAFE PRACTICE AND ENVIRONMENT

Many of the elements for safe practice and environment were covered in the design of the architecture for the iAgeHealth platform as shown in Figure 2. (Adapted from International Medical Informatics Association (IMIA)) [15]



DISCUSSION

Adopting a risk-based approach and tailoring a clinical governance framework for virtual care has proven effective in addressing the unique challenges of technology-enabled service delivery. The mapping of risks identified through the PESTLEC analysis to the adapted governance domains (Table 5) demonstrates that this framework provides comprehensive coverage across political, economic, social, technological, legal, environmental, and clinical dimensions. By aligning governance principles with these risk categories, the system ensures that accountability, safety, and quality are embedded at every level of care.

TABLE 5. MITIGATION OF RISKS USING A CLINICAL GOVERNANCE FRAMEWORK AND SYSTEM.

| Domain | Risk Issue | Clinical governance domain |
|-----------|--|------------------------------------|
| Political | Aged Care reforms requiring mandatory 24/7 Registered Nurse coverage | Governance, leadership and culture |
| Economic | Redistribution of travel and waiting costs | Safe practice and environment |

| Domain | Risk Issue | Clinical governance domain |
|---------------|--|--|
| Social | Older population, often with sensory loss and technology adoption challenges | Partnering with consumers |
| | Consumer expectations for transparency and quality of care. | Partnering with consumers |
| Technological | Advances in technology affecting usability and service delivery. | Safe practice and environment |
| | Virtual environment restricting clinical assessment and interaction quality. | Safe practice and environment |
| | Altered multidisciplinary team dynamics affecting care coordination. | Safe practice and environment |
| Legal | Regulatory requirements for accountability and safety | Governance, leadership and culture |
| | Clinical decision support requiring adaptation and escalation criteria | Clinical performance and effectiveness |
| | Scope of practice creep related to professional boundaries | Clinical performance and effectiveness |
| Environmental | Connectivity in rural and remote areas | Safe practice and environment |
| Clinical | Dependence on clinical judgment and empathy | Clinical performance and effectiveness |
| | Shifts in service models with care delivered by consumers and non-clinicians | Partnering with consumers |

This approach highlights several key insights. First, governance and leadership structures must clearly define roles and responsibilities to maintain accountability in a distributed care model. Second, robust safety and quality systems, including incident management, complaints handling, and integrated information systems, are essential to mitigate risks associated with communication breakdowns and fragmented data. Third, adapting clinical guidelines and escalation protocols for virtual contexts safeguards clinical performance and effectiveness, while capability frameworks support workforce confidence and competence. Finally, partnering with consumers through tools such as PROMS and PREMS strengthens person-centred care and ensures that consumer expectations for transparency and engagement are met.

Overall, the adapted governance framework demonstrates that virtual care can be delivered safely and effectively when risk management principles are integrated into system design. This model provides a scalable solution for organisations seeking to integrate quality and safety into virtual care environments, while ensuring compliance with regulatory standards and promoting continuous improvement.

CONCLUSION

Designing a practical clinical governance framework for virtual care involves more than simply migrating existing procedures into a digital platform. This case study demonstrates that a risk-based approach, grounded in established quality and safety standards, can successfully address the distinctive challenges associated with virtual care delivery. Through the adaptation of relevant policies, the creation of a dedicated virtual care practice framework, and the implementation of robust capability and monitoring systems, iAgeHealth has developed a model that upholds safety, quality, and accountability across all tiers of care.

Looking to the future, the achievements of this framework point to opportunities for wider adoption. Key priorities moving forward include continually refining evaluation metrics, embracing emerging technologies, and adapting the model for use in various care environments. As virtual care becomes an integral part of healthcare delivery, it will be essential to embed robust governance systems. Doing so will be critical to maintaining trust, enhancing outcomes, and fostering sustainable innovation within the sector.

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UNLOCKING LOYALTY: NURSE RETENTION IN HEALTHCARE

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INTRODUCTION

Issues with nurse retention in healthcare were magnified through and beyond the COVID-19 pandemic, but they are not new, with the shortages being described as an almost-universal challenge. [1] In Australia, health workforce data shows sustained growth, but demand is outstripping supply, particularly in acute, aged care, and regional services.[2] The result is a nursing workforce that is under sustained pressure, with high rates of intent to leave and churn across hospitals.

Turnover refers to the admission and departure of staff [3], with nurses, it is not only a human resources metric, but also a patient safety, quality and financial issue. Research has linked higher nurse turnover with higher costs, reduced continuity of patient care, and poorer health outcomes.[4] Systematic reviews show that nursing turnover is associated with work environment, lower job satisfaction, higher burnout and, in some settings increased errors and adverse events. [5] The direct and indirect costs associated with nurse turnover are significant and include cost of vacancy advertising, recruitment, onboarding, overtime and backfill, lost productivity, as well as the loss of intellectual capital. [6,7] The antecedents of turnover are complex, reviews of nurse turnover and retention consistently identify elements such as workload, the psychosocial environment, support, fairness, psychological safety, and career development as key drivers.[8]

This article explores nurse retention through a different lens, aggregating insight from nurse experience surveys across Australian healthcare organisations. Insync is an Australian research and advisory company that specialises in employee, patient, and stakeholder surveys. Insync's dedicated health team partners with public and private hospitals, primary health services, and aged care providers to measure workforce experience, culture, and engagement. De-identified data from these surveys is aggregated across clients for benchmarking purposes, and reported at a level that protects individuals, teams, and organisations. Insync does not disclose organisation-identifiable results without explicit approval, and all analysis for this article is based on aggregated, de-identified data from healthcare organisations that understand and agree to Insync retaining their de-identified data for research and benchmarking purposes.

Using this dataset, we examined trends in nurses' intent to stay between 2019 and 2024, identified key retention drivers, and translated these insights into six practical strategies that healthcare leaders can use to "unlock loyalty" and keep nurses in the roles and professions where they are needed most.

METHOD

This study analysed employee survey data collected by Insync from 2019 through to 2024 across 30 private and public Australian health organisations. The data set comprised of 63,786 responses from registered nurses, registered midwives, enrolled nurses, and endorsed enrolled nurses. Surveys were run for individual organisations at different times, aligned to

local workforce engagement or culture programs. By identifying common questions related to employees' intent to stay, the researchers sought to uncover key retention challenges and provide insights into strategies for improving staff retention. Intent to stay questions varied slightly across projects, such as, "I would like to be working at our organisation two years from now", "I would like to be working at this organisation three years from now". Responses are based on percent favourable (agree and strongly agree), and the data is broken out by length of service (LOS).

Data was aggregated across client organisations and by calendar year. All data was de-identified at a respondent level and at an organisation level before aggregation. Results presented in this paper are descriptive, focusing on directional trends as well as practical insights gleaned from a thematic review of the qualitative data based on the comments of newly employed nurses <1yr. This analysis was undertaken within Insync's standard data governance framework. Data is stored securely, access is restricted to the research and analytics team, and results are only reported at an aggregated level, in line with client contracts and ethical good practice for workforce analytics.

RESULTS

The results obtained highlight a concerning downward trend in nurses' likelihood of staying within their first year of employment, particularly in public hospitals, where this cohort, comprising 20-25% of the workforce, shows the lowest retention likelihood in five years.

GRAPH 1: THIS GRAPH DEPICTS NURSE RESPONSES REGARDING THEIR INTENT TO STAY WITH THEIR CURRENT EMPLOYER.

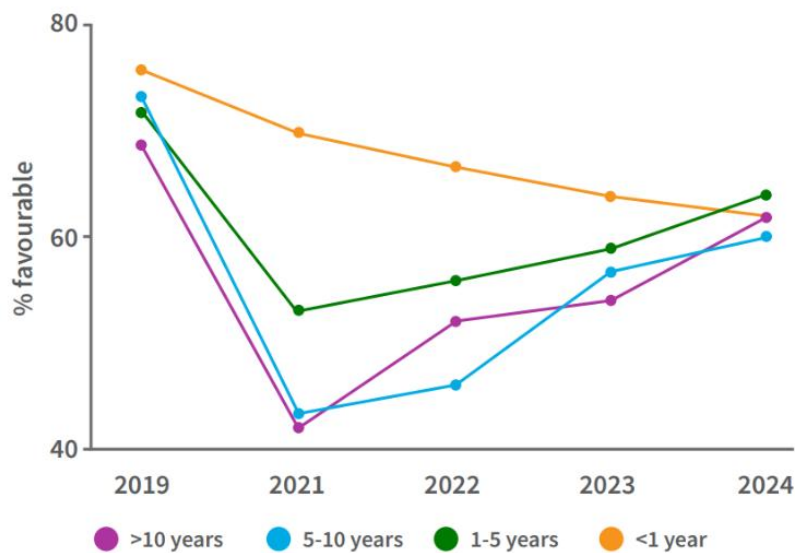


TABLE 1: RESPONSES ARE BASED ON % FAVOURABLE (AGREE AND STRONGLY AGREE), AND THE DATA IS BROKEN OUT BY LENGTH OF SERVICE (LOS)

| LOS | <1 year | 1-5 years | 5-10 years | >10 years |
|------|---------|-----------|------------|-----------|
| 2019 | 76 | 72 | 73 | 69 |
| 2021 | 70 | 53 | 43 | 42 |
| 2022 | 67 | 56 | 46 | 52 |
| 2023 | 64 | 59 | 57 | 54 |
| 2024 | 62 | 64 | 60 | 62 |

By correlating the survey items with intent-to-stay indicators (correlations of 0.6 and above), the researchers identified consistent retention factors, or influencers, across organisations, with only minor local variations. These findings are aligned with systematic reviews of nurse retention and turnover, which highlight central retention themes of work environment, a positive workplace culture, effective leadership, psychological safety, and flexibility.[9] Sample verbatim comments from newly hired nurses (>1 year with the organisation) are included in the table below for illustrative purposes.

TABLE 2: KEY INFLUENCES ON RETENTION, WITH THE CORRELATION COEFFICIENT INDICATING THE STRENGTH OF THE RELATIONSHIP BETWEEN EACH SURVEY QUESTION AND THE INTENT TO STAY ITEM. STRONG CORRELATIONS ARE 0.6 OR HIGHER. A STRONG CORRELATION DOES NOT INDICATE CAUSATION.

| Item | Correlation coefficient |
|--|-------------------------|
| The organisation cares about me/my wellbeing "I feel heard" | 0.82 |
| Work-life balance "Work-life balance with regards to rostering (means a lot)" | 0.71 |
| My work is meaningful "The commitment to high quality care makes my experience here incredibly rewarding" | 0.71 |
| Sense of belonging "In my place of work, I can feel a sense of belonging as well as support" | 0.75 |
| Patient safety is a core focus "The patient comes first" | 0.69 |

DISCUSSION

Given the exodus of experienced nursing talent throughout the pandemic, and into the current period, together with the high proportion of nurses who are either actively considering leaving or are unsure whether they will stay, retention requires urgent attention.[10] Healthcare organisations can adopt the strategies outlined below to slow the churn flywheel and move from reactive recruitment across to proactive retention.

1. A clear, well-defined retention strategy, with achievable employee turnover targets:

There is no single solution to mitigate nursing turnover. [11] Therefore, a retention strategy should deliberate the needs and desires of the employees who have been targeted for retention. [12] Additionally, organisations are encouraged to add these explicit, innovative, and measurable strategies for nurses to their workforce plans. To keep these visible, tenure-specific turnover targets should be reviewed regularly at both the executive and unit level.

2. A deep analysis into the cause of employee turnover, as well as the reason nurses stay:

This can be achieved through robust employee engagement surveys that include intent to stay items, focused pulse surveys in identified high-risk units or work areas, or through the use of stay interviews. Stay interviews are targeted 15-minute interviews with structured prompts, run in hotspots. Stay interviews can effectively help organisations identify and address intention to stay, and the reasons for this, enabling these elements to be proactively managed. [13]

3. A compelling employee value proposition (EVP), so employees want to stay:

A compelling EVP is more than a slogan, it is the lived bundle of rewards, conditions, flexibility, culture, and meaning that an organisation offers its people. EVPs are strongly linked to intention to stay. From an employee's perspective, an effective EVP answers the question "what's in it for me?" with respect to working at an organisation and helps to

develop strong employer branding. [14] Organisations are encouraged to make their EVP tangible, unique and compelling, as well as realistic and evidence-based. [14] Organisations should avoid over-promising on elements such as flexibility or professional development if they cannot deliver, because trust erodes quickly when the EVP does not match lived experience. [15] Co-designing the EVP with nurses and other frontline staff might help to align promises with operational reality.

4. Hire the right people from the start, so nurses feel the job matches what was sold:

The turnover of new graduate and early-career nurses in their first 12–24 months is a major concern. A fundamental element contributing to the retention of qualified staff is ensuring that newly hired employees are successfully assimilated into an organisation's culture at the time of hire. Person-organisation, person-group and person-job fit are all negatively related to turnover intention. [16] Therefore, when people do not fit the organisation, role or team, they are more likely to intend to leave, even in a healthcare context where staff are in short supply. In a context of chronic nursing shortages, high turnover and poor person-organisation or person-job fit mean that "just filling the vacancy" with the wrong candidate is a false economy.

5. Keep people focused on safe, high-quality, person-centred care:

Many nurses choose the profession because they genuinely want to improve patients' lives. When they are given the space to concentrate on safe, high-quality, patient focused care and can clearly see its impact, their motivation and wellbeing lift, and they are more likely to stay. Meaningful contact with patients builds a strong sense of purpose and compassion satisfaction, which in turn reinforces their commitment to both their employer and the wider profession. [17]

For healthcare organisations, actively supporting nurses' core drive to provide excellent patient care is a pivotal strategy in building a stable and engaged workforce. It requires more than just verbal encouragement, it demands the implementation of robust systems, supportive staffing models, and practical policies that enable nurses to focus on the aspects of their work that matter most. Importantly, when nurses can see and feel the value of their work, through direct patient outcomes, positive team relationships, and organisational support, they become more engaged and more likely to remain with their employer, even during periods of adversity or change.

6. Be flexible, because retention improves when employees can shape work around life:

In the wake of the pandemic, the expectation of flexibility within the workplace has shifted dramatically, becoming a fundamental requirement for many employees, nurses included. Increasingly, staff are seeking adaptable schedules that allow them to effectively balance their professional responsibilities with personal commitments such as caring for children, supporting family members, and engaging in other meaningful life activities. This shift reflects a broader change in societal values, where work is no longer viewed as the sole priority but rather as one aspect of a well-rounded life. [18]

However, introducing greater flexibility is not without its challenges. Organisations often encounter difficulties maintaining consistent productivity and clear communication when staff schedules are less rigid. There may also be concerns about how flexible arrangements could affect workplace culture, potentially disrupting established routines or team dynamics. To address these issues, it is essential that healthcare leaders carefully consider the unique context of their organisation and thoughtfully design flexible systems that meet both operational needs and employee expectations. This means actively engaging staff in the process, monitoring outcomes, and remaining open to ongoing adjustments as needs evolve. [19]

For nurses specifically, a positive and supportive work environment is crucial to retention. Ensuring good working conditions, such as safe staffing levels, fair rostering, and respectful workplace relationships provides a strong foundation. Yet, these conditions must be complemented by genuine flexibility in how, when, and where nurses work. When organisations offer options like self-scheduling and part-time roles, nurses feel empowered to shape their work around their personal circumstances. This not only improves morale and job satisfaction but also enhances nurse retention. [20]

CONCLUSION

This study confirms that nurse retention in Australian healthcare is not just a workforce issue, but a material risk to patient safety, quality of care and organisational sustainability. Despite continued growth in the nursing workforce, demand continues to outpace supply, and our analysis of 63,786 survey responses across 30 organisations shows a clear downward trend in nurses' intent to stay, particularly among those in their first year and in public hospitals. For many services, this early-stage attrition is eroding capability at exactly the time when experienced nurses are already leaving the system.

Across diverse organisations and contexts, the retention story is remarkably consistent. Nurses are more likely to stay when they feel that their organisation genuinely cares about their wellbeing, when they can balance work and life, when their work feels meaningful, when they experience a sense of belonging, and when patient safety is visibly non-negotiable. These are not "soft" factors. They are reliable indicators of whether nurses feel able to do the job they signed up for, in an environment that is fair, safe and sustainable.

The six strategies outlined in this paper translate those insights into a practical retention agenda. A clear retention strategy with tenure-specific targets, robust analysis of why nurses leave and why they stay, and a compelling, realistic employee value proposition set the strategic frame. Hiring for fit rather than simply filling vacancies, enabling nurses to focus on safe, high-quality, person-centred care, and designing flexibility that works both for staff and for the service complete the operating model. Together, these levers shift organisations from reactive recruitment to deliberate, data-driven retention. There are limitations to this work. The data are cross-sectional and descriptive, correlation does not imply causation, and survey responses are influenced by local context and timing. Further research could extend this analysis to specific specialties and examine the impact of targeted retention interventions on both workforce and patient outcomes. However, the consistency of patterns across organisations suggests that the core drivers identified here are robust and highly actionable.

For healthcare leaders, the implication is clear. Retention cannot be left to generic wellbeing programs or ad hoc initiatives. It requires an explicit strategy, informed by high-quality workforce analytics, grounded in the lived experience of nurses, and rigorously tracked over time. Organisations that invest in understanding their data, co-design their employment proposition with nurses, and systematically remove the barriers to delivering safe, meaningful care will be better placed to "unlock loyalty". In a tight and competitive labour market, those services will not only hold on to their nurses, they will build the kind of stable, engaged workforce that is essential for safe, high-quality, person-centred care into the future.

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THE INFLUENCE OF SOCIAL AND BEHAVIORAL DETERMINANTS FOR PROMOTING HEALTH IN ODISHA, INDIA

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ABSTRACT

BACKGROUND:

Access to suitable healthcare reflects both service availability and its acceptability to users. While socioeconomic status (SES) is known to influence healthcare utilization, its independent effect on perceived access remains underexplored. This study examines how socioeconomic and behavioural factors shape perceived access to suitable sources of care for acute illnesses in Odisha, India.

METHODS:

A cross-sectional household survey was conducted from October 2022 to February 2023 across six districts of Odisha, namely, Rayagada, Kalahandi, Angul, Keonjhar, Khordha, and Kendrapara, representing tribal, industrial, and coastal regions. Using a structured questionnaire adapted from the WHO "Manual for Household Survey to Measure Access and Use of Medicine," data were collected from 902 households, of which 214 (23.7%) reported acute illnesses. Chi-square tests and binary logistic regression were applied to identify determinants of perceived access (Yes/No).

RESULTS:

Overall, 66.8% of households reported finding suitable care, while 33.2% did not. Most were rural (84.6%), and 74.3% sought care outside the home. Non-adherence to treatment was observed in 44.4% of cases. In the adjusted logistic model, location, care-seeking behaviour, treatment adherence, and medicine availability were significant predictors. Urban households had higher odds of accessing suitable care (AOR = 12.67, 95% CI = 1.73–92.82) than rural ones. Households seeking care outside the home (AOR = 4.24), adhering to prescribed medicines (AOR = 14.08), and maintaining medicine stock (AOR = 4.96) were more likely to perceive suitable care. Traditional SES indicators lost significance after adjustment.

CONCLUSION:

Behavioural and attitudinal factors outweighed socioeconomic indicators in determining perceived access to suitable healthcare. Strengthening health communication, promoting adherence, and addressing trust deficits in modern medicine are essential to improve utilization. Policy interventions should bridge rural–urban gaps and integrate culturally acceptable care models to ensure equitable access.

KEYWORDS

access to care, acute illness, socioeconomic determinants, behavioural factors, Odisha, India

INTRODUCTION

Treatment-seeking behaviour is shaped by multiple socioeconomic and contextual factors such as income, access time, distance to facilities, use of home remedies, autonomy, quality of care, and privacy [1]. Evidence consistently shows that wealthier households, with greater economic resources, are more likely to use healthcare services than poorer ones [2]. Among sociodemographic factors, education has been found to correlate with the duration of untreated psychosis, while variables like age, gender, marital status, and occupation show little association [3–7]. Nurhidayah et al. (2025) also identified education as a dominant factor influencing healthcare-seeking among Egyptian parents of children with cancer [8,9].

Low treatment-seeking behaviour has been observed for hypertension in economically weaker states such as Uttar Pradesh, Bihar, Odisha, Madhya Pradesh, and Jharkhand, largely due to unaffordable medicines and limited health services [10]. Similarly, in rural Tamil Nadu, communities continue to rely on local wound treatments for rabies despite awareness of anti-rabies vaccines; most of these households belong to middle or lower socioeconomic classes [11].

Ahsan et al. (2004) highlighted that socioeconomic constraints and gender disparities hinder timely treatment for tuberculosis (TB), with women more likely to remain undiagnosed or untreated [12]. Even though TB treatment is subsidised, stigma continues to discourage care-seeking [13]. In Laos, socioeconomic barriers also limited access to malaria treatment [14], although other studies suggested that financial status may not always determine care-seeking when home remedies serve as viable alternatives [14,15].

Satisfaction with healthcare depends on quality, provider behaviour, decision-making participation, and affordability [16]. Thus, choosing a “suitable source of care” is closely tied to households' socioeconomic circumstances.

This study focuses on perceived access to suitable care for acute illnesses, which impose sudden financial stress on households, especially those in middle and lower-income brackets. Such situations often prompt coping strategies like delayed treatment, reliance on home remedies, or no treatment at all. The primary objective is to examine the relationship between household socioeconomic status and perceived access to appropriate sources of care for acute illnesses in Odisha, India.

METHODOLOGY

RESEARCH DESIGN

A cross-sectional household survey was conducted across six purposively selected districts of Odisha: Rayagada, Kalahandi, Angul, Keonjhar, Khordha, and Kendrapara. Rayagada and Kalahandi represent highly tribal and economically vulnerable areas; Angul and Keonjhar are industrial zones with changing socioeconomic conditions; and Khordha and Kendrapara are relatively affluent coastal and capital districts with higher per-capita income. The study focused on access to medicines and out-of-pocket (OOP) expenditure.

SAMPLING

The sample size was calculated using the formula $n = z^2 pq/d^2$ (where $z = 1.96$, $p = 0.558$ (55.8% prevalence of OOP expenditure on medicines), $q = 1 - p$, $d = 0.035$ (3.5% precision)) [17] resulting in an estimated 928 households after adding 20% for non-response. Ultimately, 902 households were surveyed, with 26 responses discarded due to incomplete data.

A stratified random sampling design was employed. Two blocks were selected from each district—one being the district headquarters and one remote block. Each block was divided into five localities: one urban ward and four villages (north, south, east, and west). Households were randomly selected within these areas. Eligible households had to have resided

locally for at least five years, with at least two members, and respondents aged 18 years or older who actively contributed to the household.

Data were collected through door-to-door surveys between October 2022 and February 2023 by three trained field investigators. The questionnaire, developed by the research team based on the Manual for Household Survey to Measure Access and Use of Medicine, covered demographic details, accessibility, availability, and affordability of medicines, as well as socioeconomic indicators.

STUDY POPULATION AND VARIABLES

The analysis focused on acute illnesses, defined as sudden-onset, short-duration conditions requiring immediate care [18]. Such illnesses were chosen because they expose households to abrupt health and financial shocks, unlike chronic illnesses, where treatment choices evolve gradually. Among the 902 households, 214 (23.7%) reported at least one acute illness case.

Household demographic and behavioural characteristics were analysed using frequency and percentages. Associations between dependent and independent variables were tested using chi-square analysis. Variables showing significant associations were included in the binary logistic regression model to determine the Adjusted Odds Ratio (AOR), while Unadjusted Odds Ratios (UOR) were also calculated for comparison.

The dependent variable was derived from the survey question: "Did you find a suitable source of care for the acute illness?" Responses were coded as binary (Yes = 1, No = 0), representing the household's perceived access to appropriate care sources.

RESULTS

Table 1 provides insights into the demographic, socioeconomic, and healthcare-related characteristics of households surveyed. A significant majority of households lived in rural areas (84.6%), while only 15.4% of households were residents of urban areas. North Odisha districts have the highest representation (45.8%), followed by coastal districts (35%) and south districts (19.2%), indicating a diversity in the prevalence of acute illness across the regions.

Households belonging to the general category of social groups were the highest (35%), followed by the scheduled castes and the scheduled tribes' population (34.1%) (Table 1). Other backward castes constituted 30.8% of total acute illness prevalence in the selected districts. The largest portion of the household heads have primary-level education (40.7%), also a significant portion (35%) have no schooling. Secondary and higher education together constitute 24.3% of household heads, reflecting a low overall educational attainment. A sizable portion of households fall in the "Wealthy" category (45.3%), followed by "Middle" (30.4%) and "Poor" (24.3%). Households' medicine percentage share of total lump-sum monthly expenditure was highest (43%) in the range of 0.001% to 33%.

Most respondents considered the illness "Not that serious" (77.1%), while only 7.5% rated it "Very serious" (Table 1). About two-thirds (66.8%) reported finding suitable care, while 33.2% did not. A significant majority (74.3%) sought care outside the home, reflecting proactive healthcare-seeking behaviour. Adherence to prescribed medication was low (55.6%), and nearly 45% of acute illness patients were non-adherent to prescribed medication. The major cause of non-adherence was the "patient not willing to take the medicine" (29%). More than 10% of patients were non-adherent due to accessibility challenges such as cost, distance, unavailability and lack of time for treatment and medication.

Public hospitals were the most commonly used care providers (56.1%), while private hospitals accounted for 18.2% (Table 1). Notably, 25.7% did not receive care from any formal source. Also, 79% of households with acute illness did not have any medicine stock. Most households (83.6%) reported having no insurance or reimbursement, indicating high potential out-of-pocket expenses and financial vulnerability during illnesses.

TABLE 1: DEMOGRAPHIC AND BEHAVIOURAL BACKGROUND OF HOUSEHOLDS

| Variable | Category | Frequency (Percent) |
|---|---|---------------------|
| Location of the household | Rural | 181 (84.6%) |
| | Urban | 33 (15.4%) |
| Region/ districts | North districts (Angul+Keonjhar) | 98 (45.8%) |
| | Coast districts (Kendrapara+Khordha) | 75 (35%) |
| | South districts (Rayagada+Kalahandi) | 41 (19.2%) |
| Gender of the household head | Male | 170 (79.4%) |
| | Female | 44 (20.6%) |
| Educational qualification of the household head | No schooling | 75 (35.0%) |
| | Primary (up to 9th) | 87 (40.7%) |
| | Secondary (10th) | 30 (14.0%) |
| | Higher Secondary & above | 22 (10.3%) |
| Occupation | Labourer | 82 (38.3%) |
| | Farmer | 55 (25.7%) |
| | Small shop business | 38 (17.8%) |
| | Unemployed/ not working | 5 (2.3%) |
| | Other | 34 (15.9%) |
| Social groups | Scheduled caste/ Scheduled tribe | 73 (34.1%) |
| | Other backward castes | 66 (30.8%) |
| | General | 75 (35%) |
| Wealth Index | Poor | 52 (24.3%) |
| | Middle | 65 (30.4%) |
| | Wealthy | 97 (45.3%) |
| Medicine percentage share to the total lump-sum household expenditure in a month | No expenditure | 72 (33.6%) |
| | 0.001% to 33% | 92 (43.0%) |
| | 33.001% to 66% | 29 (13.6%) |
| | 66.001% to 100% | 21 (9.8%) |
| Perceived seriousness of the illness | Not serious | 165 (77.1%) |
| | Serious | 33 (15.4%) |

| | | |
|---|--|-------------|
| | Very serious | 16 (7.5%) |
| Did you find a suitable source of care? | No | 71 (33.2%) |
| | Yes | 143 (66.8%) |
| Did you seek care outside the home? | No | 55 (25.7%) |
| | Yes | 159 (74.3%) |
| Source of care received during illness | Public care | 120 (56.1%) |
| | Private care | 39 (18.2%) |
| | None | 55 (25.7%) |
| Did the sick person take all the medicines that were prescribed? | No | 95 (44.4%) |
| | Yes | 119 (55.6%) |
| Causes of non-adherence | Adherent | 119 (55.6%) |
| | Not satisfied with prognosis | 10 (4.7%) |
| | Costly/ Far/ No time/ Unavailable medicine | 23 (10.7%) |
| | Patients were not willing to take the medicines, and other factors | 62 (29.0%) |
| Do you have any medicines available at home today? | No | 169 (79.0%) |
| | Yes | 45 (21.0%) |
| Insurance/reimbursement | No | 179 (83.6%) |
| | Yes | 35 (16.4%) |

Table 2 presents the relationship between socio-demographic variables and a binary outcome (Yes/No) of access to a suitable source of care for acute illness. The Pearson's Chi-Square test results indicate the statistical significance of these relationships.

A significant association exists between household location and the outcome ($p=0.000$). Urban households show high access to suitable sources of care (93.9%), while rural households have comparatively lower access (61.9%).

There is a statistically significant relationship ($p = 0.047$) with the region/districts variable. In the North districts (Angul and Keonjhar), the highest number of acute illness cases were reported. However, access to suitable sources of care was disproportionately higher in the southern districts (Rayagada and Kalahandi) (82.9%).

A significant relationship exists between occupation type and the outcome ($p=0.046$). Households engaged in "Others" category occupations report the highest access response rate (85.3%), while small shop businesses show the lowest (52.6%). However, the frequency is highest for the labourer group, and 69.5% of labourers reported access to a suitable source of care.

Sources of care and access to suitable care were also significantly associated. It shows that public care was the most utilized care compared to private. However, the proportion of access to suitable care had the least difference between

private and public care. At the same time, those who did not seek treatment from anywhere mostly mentioned that they did not have access to a suitable source of care.

Significant associations are observed for household location, region/district, and occupations, highlighting key socio-demographic factors that influence the outcome. In terms of behaviour, 'care sought outside home', sources of care, adherence to prescription, causes of non-adherence, and stock of medicines were also significant in relation to access to suitable sources of care. The variables with p-values below 0.05 warrant further investigation for potential policy and programmatic interventions.

TABLE 2: HOUSEHOLDS' DEMOGRAPHIC AND SOCIOECONOMIC INDICATORS' ASSOCIATION WITH SUITABLE SOURCES OF CARE

| Variable | Category | Access to suitable sources of care | | Total | p-value |
|--|--------------------------------------|------------------------------------|-------------|-----------|----------|
| | | No (%) | Yes (%) | | |
| Gender of household head | Male | 56 (32.9%) | 114 (67.1%) | 170 (100) | 0.885 |
| | Female | 15 (34.1%) | 29 (65.9%) | 44 (100) | |
| Education of household head | No schooling | 19 (25.3%) | 56 (74.7%) | 75 (100) | 0.112 |
| | Primary (up to 9th) | 37 (42.5%) | 50 (57.5%) | 87 (100) | |
| | Secondary (10th) | 9 (30.0%) | 21 (70.0%) | 30 (100) | |
| | Higher Secondary & above | 6 (27.3%) | 16 (72.7%) | 22 (100) | |
| Location of the household | Rural | 69 (38.1%) | 112 (61.9%) | 181 (100) | 0.000*** |
| | Urban | 2 (6.1%) | 31 (93.9%) | 33 (100) | |
| Region/ district | North districts (Angul+Keonjhar) | 35 (35.7%) | 63 (64.3%) | 98 (100) | 0.047* |
| | Coast districts (Kendrapara+Khordha) | 29 (38.7%) | 46 (61.3%) | 75 (100) | |
| | South districts (Rayagada+Kalahandi) | 7 (17.1%) | 34 (82.9%) | 41 (100) | |
| Social groups | Scheduled Caste/ Scheduled Tribe | 24 (32.9%) | 49 (67.1%) | 73 (100) | 0.200 |
| | Other Backward Castes | 27 (40.9%) | 39 (59.1%) | 66 (100) | |
| | General | 20 (26.7%) | 55 (73.3%) | 75 (100) | |
| Insurance/ Reimbursement | No | 57 (31.8%) | 122 (68.2%) | 179 (100) | 0.349 |
| | Yes | 14 (40.0%) | 21 (60.0%) | 35 (100) | |
| Wealth Index | Poor | 11 (21.2%) | 41 (78.8%) | 52 (100) | 0.065 |
| | Middle | 27 (41.5%) | 38 (58.5%) | 65 (100) | |
| | Wealthy | 33 (34.0%) | 64 (66.0%) | 97 (100) | |
| Household Occupation | Labourer | 25 (30.5%) | 57 (69.5%) | 82 (100) | 0.046* |
| | Farmer | 21 (38.2%) | 34 (61.8%) | 55 (100) | |
| | Small shop business | 18 (47.4%) | 20 (52.6%) | 38 (100) | |
| | Unemployed/ Not working | 2 (40.0%) | 3 (60.0%) | 5 (100) | |
| | Others | 5 (14.7%) | 29 (85.3%) | 34 (100) | |
| Medicine percentage share to the total lump- | No expenditure | 27 (37.5%) | 45 (62.5%) | 72 (100) | 0.394 |
| | 0.001% to 33% | 25 (27.2%) | 67 (72.8%) | 92 (100) | |
| | 33.001% to 66% | 12 (41.4%) | 17 (58.6%) | 29 (100) | |

| | | | | | |
|--|--|------------|-------------|-----------|----------|
| sum household expenditure in a month | 66.001% to 100% | 7 (33.3%) | 14 (66.7%) | 21 (100) | |
| Perceived seriousness of the illness | Not serious | 56 (33.9%) | 109 (66.1) | 165 (100) | 0.361 |
| | Serious | 8 (24.2%) | 25 (75.8%) | 33 (100) | |
| | Very serious | 7 (43.8%) | 9 (56.3%) | 16 (100) | |
| Care sought outside the home | No | 40 (72.7%) | 15 (27.3%) | 55 (100) | 0.000*** |
| | Yes | 31 (19.5%) | 128 (80.5%) | 159 (100) | |
| Source of care received during illness | Private care | 7 (17.9%) | 32 (82.1%) | 39 (100) | 0.000*** |
| | Public care | 24 (20%) | 96 (80%) | 120 (100) | |
| | None | 40 (72.7%) | 15 (27.3%) | 55 (100) | |
| Did the sick person take all the prescribed medicines? | No | 57 (60%) | 38 (40%) | 95 (100) | 0.000*** |
| | Yes | 14 (11.8%) | 105 (88.2%) | 119 (100) | |
| Causes of non-adherence | Adherent | 14 (11.8%) | 105 (88.2%) | 119 (100) | 0.000*** |
| | Not satisfied with prognosis | 5 (50%) | 5 (50%) | 10 (100) | |
| | Costly/ Far/ No time/ Unavailable medicine | 10 (43.5%) | 13 (56.5%) | 23 (100) | |
| | Patients were not willing to take medicines, and other factors | 42 (67.7%) | 20 (32.3%) | 62 (100) | |
| Do you have any medicines available at home today? | No | 64 (37.9%) | 105 (62.1%) | 169 (100) | 0.005** |
| | Yes | 7 (15.6%) | 38 (84.4%) | 45 (100) | |
| Total | | 71 (33.2%) | 143 (66.8%) | 214 (100) | |

***p<0.001, **p<0.010, *p<0.050

Table 3 contains unadjusted (UOR) and adjusted (AOR) logistic regression models. The adjusted logistic regression model included only those independent variables that were found to be significantly associated with the 'perceived access to suitable sources of care' in the chi-square test shown in Table 2. However, unadjusted odds ratio analysis was performed to investigate the impact of individual independent variables on the dependent variable using logistic models.

The adjusted model demonstrated good fit (Hosmer–Lemeshow $p = 0.949$) and explanatory power (Nagelkerke $R^2 = 0.564$), with an acceptable -2 Log Likelihood value of 160.526, indicating that the specified predictors adequately explained the observed variation in the outcome.

Four variables retained statistical significance in the adjusted model: location, care-seeking outside the home, adherence to prescribed medicines, and availability of medicines at home. Urban households had substantially higher odds of accessing suitable sources of care compared with rural households (AOR = 12.67, 95% CI = 1.73–92.82), reflecting the advantages of urban health infrastructure and proximity to healthcare facilities. Seeking care outside the home was positively associated with appropriate care access (AOR = 4.24, 95% CI = 1.60–11.26), underscoring the role of proactive treatment-seeking behavior in improving access and outcomes.

Adherence to prescribed treatment was a strong predictor of access to suitable care (AOR = 14.08, 95% CI = 4.99–39.73). This suggests that treatment compliance is not only a behavioral outcome but also indicative of effective health system interaction and patient trust. Similarly, households maintaining a stock of essential medicines were nearly five times more

likely to access suitable care (AOR = 4.96, 95% CI = 1.62–15.23), highlighting the relevance of household preparedness and the accessibility of basic pharmaceuticals.

Some associations observed in unadjusted models were attenuated after adjustment. Education level, wealth index, and social group were significant in the bivariate analysis but lost significance in the multivariate model, suggesting mediation through behavioral and structural factors. Likewise, while care received from both public and private facilities was strongly associated with access in the UOR model, only public care remained significant after adjustment (AOR = 0.26, 95% CI = 0.08–0.87), possibly reflecting differential perceptions of care quality or satisfaction across providers.

Overall, the analysis demonstrates that both structural determinants (location, medicine availability) and behavioral determinants (care-seeking and adherence) critically influence access to suitable sources of care for acute illnesses in Odisha. These findings emphasize the need to strengthen rural healthcare infrastructure, ensure the availability of essential medicines, and promote adherence through targeted health communication and community-based interventions to achieve equitable healthcare access.

TABLE 3: MEASUREMENT OF ACCESS TO A SUITABLE SOURCE OF CARE USING THE ADJUSTED AND UNADJUSTED LOGISTIC REGRESSION MODELS

| | UOR | Sig. | 95% C.I. | AOR | Sig. | 95% C.I. | VIF |
|-----------------------------------|------|---------|------------|-------|---------|------------|------|
| Education of the HH Head | | | | | | | |
| No schooling (Reference.) | | 0.12 | | - | - | - | |
| Primary | 0.46 | 0.02* | 0.23-0.90 | - | - | - | |
| Secondary | 0.79 | 0.63 | 0.31-2.02 | - | - | - | |
| Higher secondary & above | 0.91 | 0.86 | 0.31-2.65 | - | - | - | |
| Wealth Index | | | | | | | |
| Poor (Reference) | | 0.07 | | - | - | - | |
| Middle | 0.38 | 0.02* | 0.17-0.87 | - | - | - | |
| Wealthy | 0.52 | 0.1 | 0.24-1.14 | - | - | - | |
| Social groups | | | | | | | |
| SC/ST (Reference) | | 0.2 | | - | - | - | |
| Other Backward Castes | 0.71 | 0.33 | 0.35-1.41 | - | - | - | |
| General | 1.35 | 0.41 | 0.66-2.73 | - | - | - | |
| Location | | | | | | | 1.12 |
| Rural (Reference) | | | | | | | |
| Urban | 9.55 | 0.002** | 2.22-41.16 | 12.67 | 0.012** | 1.73-92.82 | |
| Districts | | | | | | | 1.23 |
| North districts (Reference) | | 0.06 | | | 0.08 | | |
| Coast districts | 0.88 | 0.69 | 0.47-1.64 | 0.46 | 0.24 | 0.12-1.7 | |
| South districts | 2.7 | 0.03* | 1.08-6.72 | 2.55 | 0.17 | 0.67-9.78 | |
| Occupation | | | | | | | 1.1 |
| Labourer (Reference) | | 0.06 | | | 0.16 | | |
| Farmer | 0.71 | 0.35 | 0.35-1.46 | 0.38 | 0.13 | 0.11-1.31 | |
| Small shop business | 0.49 | 0.08 | 0.22-1.07 | 0.35 | 0.08 | 0.1-1.15 | |
| Unemployed/ not working | 0.66 | 0.66 | 0.1-4.18 | 0.62 | 0.71 | 0.05-7.41 | |
| Others | 2.54 | 0.08 | 0.88-7.34 | 1.48 | 0.61 | 0.33-6.62 | |
| Seek care outside the home | | | | | | | 6.28 |
| No (Reference) | | | | | | | |

| | | | | | | | |
|---|-------|---------|------------|-------|---------|------------|------|
| Yes | 11.01 | 0.00*** | 5.41-22.43 | 4.24 | 0.004** | 1.6-11.26 | |
| Care received during the illness | | | | | | | 5.6 |
| None (Reference) | | 0.00*** | | | 0.03 | | |
| Public care | 10.67 | 0.00*** | 5.07-22.43 | 0.26 | 0.03 | 0.08-0.87 | |
| Private care | 12.19 | 0.00*** | 4.44-33.48 | - | - | - | |
| Did the sick person take all the prescribed medicines? | | | | | | | 2.32 |
| No (Reference) | | | | | | | |
| Yes | 11.25 | 0.00*** | 5.63-22.48 | 14.08 | 0.00*** | 4.99-39.73 | |
| Causes of non-adherence | | | | | | | 2.25 |
| Adherent (Reference) | | 0.00*** | | | 0.36 | | |
| Costly/ Far/ No time/ Unavailable medicine | 0.17 | 0.001** | 0.06-0.47 | 3.22 | 0.19 | 0.56-18.45 | |
| Patient not willing to take medicine and other factors | 0.63 | 0.00*** | 0.03-0.14 | 1.69 | 0.41 | 0.48-5.94 | |
| Not satisfied with prognosis | 0.13 | 0.004** | 0.3-0.52 | - | - | - | |
| Do you have any medicines available at home today? | | | | | | | 1.17 |
| No (Reference) | | | | | | | |
| Yes | 3.31 | 0.007** | 1.39-7.85 | 4.96 | 0.005** | 1.62-15.23 | |

***p<0.001, **p<0.010, *p<0.050

DISCUSSION

Socioeconomic and behavioural factors have long been studied as determinants of health outcomes, yet their independent influence on perceived access to suitable healthcare sources remains underexplored. Consistent with earlier findings, this study reaffirms that higher socioeconomic status is generally associated with better access to healthcare [1,2,19]. However, access does not automatically translate into utilization. True access exists only when services are both available and acceptable. Lantz [20] previously emphasized that disadvantaged populations face structural and cultural barriers to healthcare. Extending this view, the present study suggests that the issue may not always be socioeconomic disadvantage; rather, households across economic groups may refrain from seeking care due to perceptions of unsuitability, often rooted in distrust or negative beliefs about modern medicine [21].

Interestingly, households in southern Odisha reported higher satisfaction with healthcare access than those in the north, despite limited availability of pharmacies and facilities [22]. This paradox may be explained by the prominence of Indigenous and alternative medicine systems in tribal southern districts [23], where communities rely on traditional healing practices and feel less dependent on formal healthcare.

The rural-urban divide emerged as a significant determinant in the adjusted regression model. Urban households reported better access to suitable care, confirming enduring geographic disparities. Although rural healthcare infrastructure has improved, as noted by Arora (2024) [24], rural households still perceive difficulty finding suitable care sources.

While traditional socioeconomic variables, such as education, wealth, and social groups, were not statistically significant predictors, attitudinal and behavioural factors such as care-seeking outside the home and treatment adherence showed strong associations with perceived access. This highlights that behavioural patterns outweigh socioeconomic status when determining access. Households seeking care outside the home were more likely to perceive suitable services, whereas those remaining homebound or non-adherent tended to view available care as unsuitable.

The study, therefore, highlights the importance of examining the attitudinal and cultural dimensions of healthcare access in conjunction with conventional socioeconomic factors. Future research should adopt a mixed-methods approach to explore these behavioural dynamics more deeply.

STRENGTHS AND LIMITATIONS

A major strength of the study lies in establishing the dominant role of behavioural and attitudinal factors over socioeconomic determinants in shaping perceived access to care. However, the analysis lacks specific data on the contribution of alternative and Indigenous medicine systems, which might explain regional differences, especially the higher satisfaction levels in Odisha's tribal-dominated south. Incorporating these traditional practices into future studies would enrich understanding healthcare access patterns in culturally diverse regions.

CONCLUSION

Overall, two-thirds of households affected by acute illnesses reported satisfactory access to suitable care, yet nearly one-fourth did not seek treatment outside their homes, and many displayed poor treatment adherence. These findings reveal persistent gaps in public health outreach, suggesting that the health system must ensure the inclusion of every household, particularly in rural and underserved areas. Strengthening trust in modern medicine and addressing community perceptions are crucial for improving utilization. Policymakers should focus on bridging the rural-urban gap and integrating culturally acceptable care models to achieve equitable and sustainable healthcare access.

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A written consent was obtained from participants before beginning the study

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AGEING POPULATIONS IN INDIA: TOWARDS INTEGRATED AND EQUITABLE GERIATRIC CARE

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ABSTRACT

The ageing population represents a transformative demographic shift in India. It is posing both challenges and opportunities for public policy. The growing elderly population, now exceeding 100 million, is projected to reach around 20% of the total by 2050. There is an emerging need for a holistic approach. Despite policy frameworks such as the National Policy on Older Persons (1999) and the National Policy for Senior Citizens (2011), India's approach to geriatric concerns remains fragmented and under-resourced. The Structural deficiencies, weak inter-sectoral coordination, and limited financial resources have constrained effective implementation. This paper critically examines the evolution and scope of India's social security policies. It analyzes policy planning and identifies systemic healthcare delivery and social protection gaps based on national data and comparative evidence. The paper concludes that achieving equitable geriatric care in India requires multisectoral collaboration, enhanced community-based service models, and sustained investment in preventive and long-term care infrastructure.

KEYWORDS

Active ageing, geriatric policy, public health, social protection, age-friendly environment

INTRODUCTION

The ageing population in India is one of the most significant social transformations of the 21st century. Improvements in life expectancy, with declining fertility rates, are resulting in a rapidly expanding elderly population across the Global South [1]. In India, persons aged 60 years and above are projected to constitute nearly one-fifth by 2050 [2]. This demographic transition has implications for health systems, social security frameworks, and intergenerational equity.

Unlike high-income countries with well-established institutional and community-based care systems, India's ageing population depends mainly on informal family support and traditional care structures [3,4]. Urbanisation, migration, and changing household dynamics have weakened these traditional safety nets. This is exposing older adults, particularly women, widows, and the rural poor, to vulnerabilities related to income insecurity, social isolation, and deteriorating health [5]. Overall, there are concerns for the care of the elderly in urban and rural areas. These policies are constrained by fragmented governance and inadequate coordination between health, welfare, and local administrative bodies [6].

Globally, the discourse on ageing has shifted from a welfare-based to a rights-based paradigm that emphasises autonomy, participation and productivity among the elderly [7]. Within this framework, India's challenge is not merely to extend lifespan but to ensure "healthspan", a period of life marked by physical, mental, and social well-being [8,9]. The paper critically examines India's evolving policy landscape for the elderly through the lens of access, equity, and integration.

METHODOLOGY

This review employed a narrative and integrative review design to synthesise existing literature on social security policies. The methodology aimed to capture both the range of policy evolution and the depth of implementation challenges concerning geriatric health and social protection.

A systematic search was conducted across multiple academic databases, PubMed, Scopus, Google Scholar, and JSTOR, as well as national policy repositories such as the Ministry of Health and Family Welfare (MoHFW), Ministry of Social Justice and Empowerment, and NITI Aayog archives. The review encompassed materials published between 1999 and 2025, spanning across the period following the launch of the National Policy on Older Persons (1999) to recent frameworks under the *UN Decade of Healthy Ageing (2021–2030)*.

Search keywords included combinations of "ageing population," "geriatric health," "elderly policy India," "social protection," "active ageing," "NPHCE," and "National Policy for Senior Citizens." Both peer-reviewed journal articles and published documents (including government reports, policy briefs, research theses, and NGO publications) were included to ensure comprehensive coverage of the evidence base.

The inclusion criteria focused on studies and reports that addressed:

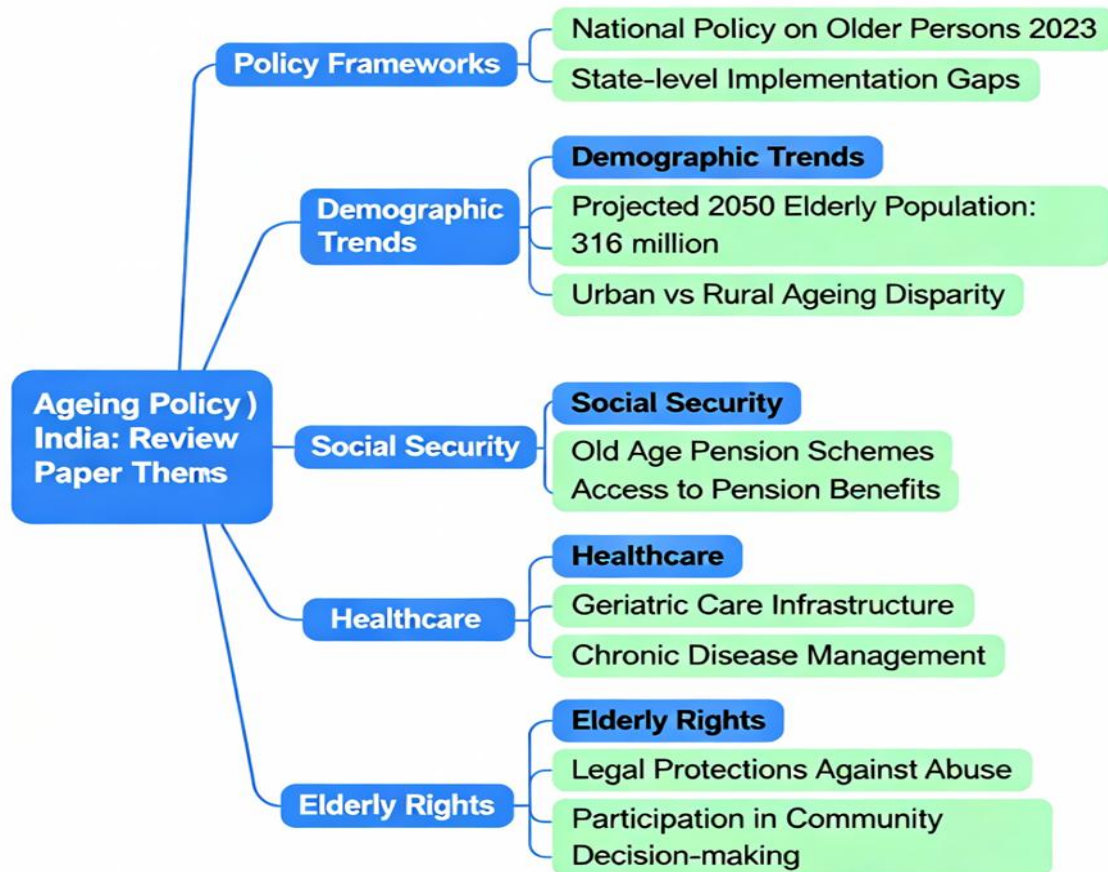
1. Health system responses to ageing in India.
2. Social security and welfare mechanisms for the elderly.
3. Policy implementation challenges and innovations in the Indian context.

Data extraction followed a thematic synthesis approach [10], allowing for the identification of recurrent policy themes, such as access, integration, equity, and active ageing. The findings were critically seen through the Levesque et al. (2013) [11] framework on healthcare access and the WHO (2020) model of healthy ageing.

DATA ANALYSIS FRAMEWORK FOR ELDERLY

The review adopted a thematic combination approach to analyse the collected literature, enabling integration of findings across diverse policy and empirical sources. All included documents were read in full, and themes and sub-themes were manually coded using inductive and deductive techniques. Deductive coding was guided by the Levesque et al. (2013) [11] framework on access to services.

FIGURE 1. THEMATIC FRAMEWORK



The coded themes and sub-themes were arranged accordingly: (i) Evolution of Geriatric Health and Social Policies in India (1999–2025), (ii) Critical Analysis of Implementation: NPOP, NPHCE and State-level Variations (iii) Health and Social Determinants of Elderly Well-Being in India (iv) Towards Active and Healthy Ageing: Policy Gaps and Innovations. Thematic convergence and discrepancy were identified across national and subnational policies. The synthesis process emphasised contextual interpretation and triangulation of policy texts, empirical studies, and implementation evidence, ensuring analytical rigour and relevance to India's evolving ageing policy (Figure 1).

CONCEPTUAL FRAMEWORK: ACCESS, INTEGRATION AND ACTIVE AGEING

The paper adopted a conceptual framework (Figure 2) rooted in access to care and system integration to analyse India's geriatric policy environment. Drawing on Levesque et al. (2013) [11] model of healthcare access, the paper considers access in five interrelated dimensions: approachability (ability to perceive services), acceptability (willingness to seek), availability and accommodation (ability to reach), affordability (ability to pay) and appropriateness (ability to engage). For elderly, ageing-friendly policies require integrating health and social services, as medical care alone is insufficient. Older persons face multiple chronic conditions, functional limitations, and social vulnerabilities [12]. Thus, social protection, community engagement and long-term care strategies must complement health system responsiveness. An active and healthy ageing framework enables older persons to remain socially engaged and economically productive [13, 14].

Applying this framework in the Indian context reveals persistent access and service delivery disparities. This is driven by demographic diversity, geographic variation and institutional capacity. The ensuing sections concern tracing policy evolution and critically assessing implementation gaps.

FIGURE 2. CONCEPTUAL FRAMEWORK REFRAMING SOCIAL SECURITY POLICY FOR AGEING POPULATIONS IN INDIA



EVOLUTION OF GERIATRIC POLICIES IN INDIA (1999–2025)

EARLY POLICY MILESTONES

India's first substantial policy for older persons, the *National Policy on Older Persons (NPOP)*, was adopted in 1999. It marked an essential commitment to social justice for the elderly, recognising them as citizens with rights rather than passive dependents [15]. The NPOP proposed social security, health care, housing, and age-friendly environments.

POLICY RENEWAL AND CONSOLIDATION

In 2011, the *National Policy for Senior Citizens* was endorsed to mainstream older persons, supporting ageing in place, promoting home and community care rather than institutionalisation, and enhancing financial and social security [16]. Programmes such as the Indira Gandhi National Old Age Pension Scheme (IGNOAPS) and the Pradhan Mantri Vaya Vandana Yojana (PMVVY) sought to provide cash support and insurance. The Ministry of Social Justice and Empowerment also introduced the Senior Care Ageing Growth Engine (SAGE) initiative in 2021 to promote innovation in elderly care services [17].

SPECIFIC PROGRAMME FOR HEALTH

In response to growing demands for geriatric health services, the NPHCE was launched to provide age-friendly primary, secondary, and tertiary services. It promotes screening, rehabilitative care, palliative care, and professional training [16]. A review of the NPHCE found that, while the programme has achieved, it faces critical challenges in human resources, infrastructure, and monitoring systems [6].

RECENT POLICY ENVIRONMENT AND INTERNATIONAL COMMITMENTS

India's ageing trajectory was reaffirmed in the Economic Survey, which highlighted the urgent need. It was noted that the concept of a "silver dividend" [18] was highlighted. At the same time, international frameworks, such as the Decade of Healthy Ageing (2021–2030), age-friendly environments, and innovation in long-term care [19]. Furthermore, the UNFPA's India Ageing Report 2023 projects that the elderly share will rise from 10.1% in 2021 to 20.8% by 2050 [20].

CRITICAL ANALYSIS OF IMPLEMENTATION

FISCAL AND INSTITUTIONAL GAPS

Although the policy rhetoric is commendable, several authors highlight systemic disconnects between the objective and implementation. For example, the public-facing assumption that informal family care will serve decreases [21,22]. It shows that around 30% of older persons live alone or only with another older family member, lacking younger household members for care [23]. Budgetary allocations to elderly care programmes remain modest and are often subsumed [24]. The Economic Survey noted that the Indian elder-care industry is valued at approximately USD 7 billion yet suffers from infrastructure deficits [25].

Governance fragmentation across ministries (Health, Social Justice, Rural Development, Finance) further complicates coordinated implementation. Without designated monitoring agencies and clear accountability frameworks, rollout remains irregular.

ACCESS AND EQUITY ISSUES

Using Levesque's access dimensions, substantial deficits are observed:

- **Approachability & Acceptability:** Awareness of geriatric services remains low in rural and marginalised communities; only 28% of older persons reportedly know of concessions for senior citizens in some surveys [26, 27, 1].
- **Availability & Accommodation:** Infrastructure remains limited, especially in remote areas. While primary health centres may exist, geriatric-friendly design, dedicated wards, trained geriatricians, or rehabilitation services are rare [28].
- **Affordability:** Though pensions and insurance schemes exist, many older persons, especially outside the formal sector, lack cover. The reliance on out-of-pocket payments remains high [29,30].
- **Appropriateness:** Care models often remain hospital-centric rather than oriented towards home and community care. Multimorbidity, functional limitations and mental health issues require integrated care pathways, which are weakly developed [31,32].

The Longitudinal Ageing Study in India (LASI) reported that approximately 75% of older adults have at least one chronic disease, 24% have limitations in activities of daily living (ADLs), and 48% have at least one limitation in instrumental activities of daily living (IADLs) [33]. Moreover, around 70% of older persons depend on others for maintenance, and 78% live without pension coverage in certain poor cohorts.

STATE-LEVEL VARIATION

Implementation also varies significantly across states. Some states, such as Kerala, Himachal Pradesh and Goa, have developed relatively stronger systems of elder-care community services; others lag [34]. The differential in capacity, commitment and demographic profile means that national policy must be adapted to the state context rather than delivered as a one-size-fits-all model.

GAPS IN SOCIAL PROTECTION AND LONG-TERM CARE

While the pension schemes provide a minimal social floor (e.g., IGNOAPS), many older persons remain financially insecure. About half of the elderly in India reportedly have no source of income, and only 11% have access to old-age pensions [35]. Moreover, long-term care (LTC), including assisted living, home care services, rehabilitation, and palliative care, remains a promising area and is primarily delivered by the private sector or NGOs, rather than the public sector [23].

HEALTH AND SOCIAL DETERMINANTS OF ELDERLY WELL-BEING IN INDIA

EPIDEMIOLOGY OF AGEING

The health needs of the elderly are shaped by multiple factors such as chronic disease burden, functional limitation, mental health, and disability [36]. Data from the NSSO 2014 indicate that sickness or poor health is reported by approximately 30% of individuals aged 60–69 years [37]. Earlier estimates found that 41.8% of the elderly in India suffered chronic diseases in 2007, increasing to 64.8% by 2011 [12]. Mental health is a crucial yet often overlooked aspect. The older women, the poorer elderly and less-educated older persons report higher rates of depression and anxiety [31]. In India, visual and hearing disabilities affect about 4% of the older population [38].

FUNCTIONAL CAPACITY AND ACTIVITIES OF DAILY LIVING

Functional limitations are key to elderly well-being and place demands on both health and social care systems. Activities of Daily Living (ADLs), such as feeding, bathing, dressing, using the toilet, and mobility, are foundational to living independently [1]. Studies show that bathing is often the most difficult ADL, followed by toileting, dressing and mobility [39, 40]. Among those aged over 80, about 27% were incapacitated, and one-third had restricted movement [41]. Other studies found that 13% of older persons suffer a disability affecting at least one ADL, 27% have mild disability, and 37% have higher disabilities [36].

SOCIAL DETERMINANTS

Social determinants such as living arrangements, economic status, and family support influence the well-being of the elderly. In India, one-fifth of older persons live with only a spouse; increasingly, the elderly live alone due to migration of younger adults or changing family structures [2]. Sub-national surveys indicate that around half of older persons have no income source, and only 11% have pensions [35]. Economic marginalisation is especially acute among older women, widows, rural residents and those in informal sectors [41].

Elder abuse is another critical issue in India. According to a 2015 survey by HelpAge India, nearly half of older persons reported some form of abuse by caregivers, family members, or others [5]. Such social vulnerabilities exacerbate health and care burdens and further emphasise the need for integrated social and healthcare responses.

ACCESS TO GERIATRIC CARE

Access to healthcare for the elderly population in India remains uneven and largely constrained by socioeconomic, geographic, and infrastructural factors. Despite the introduction of programmes such as the *National Programme for Health Care of the Elderly (NPHCE, 2010)* and the expansion of primary health infrastructure under Ayushman Bharat-Health and Wellness Centres (HWCs), the availability of dedicated geriatric services remains limited, particularly in rural and tribal districts [42].

Physical accessibility remains a critical concern. According to the *Longitudinal Ageing Study in India (LASI, Wave 1, 2020)*, nearly one-third of the elderly report difficulty reaching a health facility due to distance, mobility issues, or lack of transportation. The shortage of geriatric specialists and age-friendly facilities at district hospitals and community health centres exacerbates this gap [43]. In Odisha and Chhattisgarh, for example, only a fraction of health facilities have trained geriatric staff or accessible infrastructure, limiting service uptake.

Economic access poses an additional barrier. Out-of-pocket expenditure (OOPE) on chronic disease management, medicines, and diagnostics remains high among older adults, with over 65% of elderly respondents reporting financial strain [37]. Although social health insurance schemes, such as Ayushman Bharat – PMJAY, have expanded coverage to include elderly-specific packages and long-term care, the coverage remains minimal [44].

Acceptability and awareness further influence the care-seeking behaviour of older adults. Traditional reliance on home-based or informal care, combined with limited geriatric literacy. Cultural norms emphasising self-reliance among the

elderly also discourage proactive health-seeking, particularly for mental health or functional disabilities [45]. These findings align with Levesque et al.'s (2013) [11] conceptualisation that access is not merely a matter of supply but an interaction between user capacities and service responsiveness.

INTEGRATION OF HEALTH AND SOCIAL POLICY

The ageing challenge in India is multidimensional, demanding coordination across health, housing, and labour sectors. However, policy analysis discloses fragmentation between health services and social protection systems. The *National Policy for Senior Citizens (2011)* advocates a life-course approach to ageing. However, rather than systemic integration, implementation remains limited to welfare-based interventions such as pensions, concessions, and old-age homes [46]. At the district level, weak interdepartmental coordination and the absence of shared data systems hinder the delivery of holistic services [47].

Emerging initiatives, such as the *Integrated Elderly Care Centres (IECCs)* and *Elderline Helpline (14567)*, demonstrate progress towards integrated service delivery by linking health, counselling, and social welfare services. Similarly, the *Decade of Healthy Ageing (2021–2030)* framework encourages convergence of health promotion. However, integration remains largely programmatic rather than systemic, lacking sustainable governance and financial mechanisms [48].

Policy consistency can be strengthened through the *Health in All Policies (HiAP)* approach, which aligns ageing concerns across ministries and local governance. Community-based models such as Kerala's *Vayomithram* project showcase the potential of integrating primary healthcare with social participation and home-based support [49].

EQUITY AND INCLUSION IN AGEING PROGRAMMES

Equity in geriatric health and social protection remains a central policy concern in India. The vast disparities across gender, socioeconomic class, and geography are a significant challenge. Older women, widows, and those in rural and tribal areas face intersectional vulnerabilities. This was reflected in poorer health outcomes, limited pension coverage, and higher dependency ratios [50]. Data from LASI (2020) indicate that older women are 1.5 times more likely to suffer from functional limitations and twice as likely to be economically dependent compared to men [22].

While national initiatives such as *Indira Gandhi National Old Age Pension Scheme (IGNOAPS)* provide a bare social security floor, benefit adequacy and coverage remain limited. Rural and informal sector workers, who constitute most of India's ageing population, are particularly excluded from contributory pension schemes and employer-based benefits [51].

From a health equity standpoint, the urban–rural divide persists. Urban centres offer better access to tertiary care and private providers, while rural areas depend heavily on under-resourced public facilities [52]. Caste and regional disparities further compound inequities; for instance, elderly populations in eastern and central India, Odisha, Chhattisgarh, and Jharkhand report lower service utilisation and higher unmet needs [53].

TOWARDS ACTIVE AND HEALTHY AGEING

THE CONCEPT OF ACTIVE AGEING

The active ageing paradigm emphasises the capacity of older persons to continue contributing to society economically, socially, and culturally rather than being passive recipients of care. The AgeWatch Index 2015 ranked India 71st among 96 countries for older-person well-being, behind neighbouring countries [5]. The shift from mere dependence to productive engagement is foundational to sustainable ageing policy [54].

Promoting volunteering, caregiving, paid or unpaid work, grand-parenting, and community engagement are all part of this agenda [55]. In India, older persons with higher socioeconomic status are less likely to be employed and more likely to engage in social or community activities, indicating a shift in what ageing can mean [54].

INNOVATIONS AND DIGITAL HEALTH

The pandemic recently enhanced digital health and care-support platforms for older persons in India. A study noted that app-based “later-life care” is growing, enabling the elderly to monitor their health and design care networks. It also raises concerns of digital exclusion among rural or lower-income older persons [56].

COMMUNITY-BASED AND HOME-CARE MODELS

The literature highlights that long-term care systems should support ageing in place rather than institutionalisation. For example, home-care models with trained caregivers, day-care centres, community clubs, and mobile clinics (such as the Vayomithram Project in Kerala) demonstrate locally adapted models [57,49]. The challenge lies in replicating such models at scale, particularly in rural and semi-urban contexts.

DISCUSSION

The demographic transition unfolding in India signifies an ageing population and a transformation in the country's social and health landscape. The findings of this review underscore three interrelated challenges: restricted access, fragmented policy integration, and deep-seated. Addressing these requires reimagining ageing within a life-course and systems approach, consistent with global frameworks such as the World Health Organisation's (WHO) Decade of Healthy Ageing (2021–2030) and the Sustainable Development Goals (SDGs).

ALIGNING INDIA'S AGEING POLICY WITH GLOBAL COMMITMENTS

Globally, the WHO defines healthy ageing as “the process of developing and maintaining the functional ability that enables well-being in older age.” These framing shifts focus from disease management to functional ability, participation, and autonomy, which remain underrepresented in India's ageing policy discourse. The National Policy for Senior Citizens (2011) and the National Programme for Health Care of the Elderly (NPHCE) have made significant steps in recognising the multidimensional needs of older persons.

Integration with the SDG framework, particularly Goal 3 (Good Health and Well-being), Goal 10 (Reduced Inequalities), and Goal 11 (Sustainable Cities and Communities), offers a strategic pathway for India. It is mainstreaming ageing concerns into broader health and development agendas. Ensuring access to quality essential health services, reducing financial hardship from healthcare expenditure, are directly relevant to improving elderly well-being. The UN Decade of Healthy Ageing further encourages member states to operationalise ageing within the pillars of integrated care, long-term support, age-friendly environments, and combating ageism, all of which remain areas requiring substantial policy attention in India.

ADVANCING ACCESS THROUGH PRIMARY HEALTH SYSTEMS AND DIGITAL INNOVATION

The review findings highlight that geographic and economic barriers constrain access to geriatric care in India. In line with the Universal Health Coverage (UHC) roadmap, primary healthcare systems must serve as the foundation for equitable access to elderly services. Strengthening Health and Wellness Centres (HWCs) under Ayushman Bharat with trained geriatric personnel, assistive devices, and screening services for chronic and mental health conditions can improve reach and continuity of care.

Digital health innovations under the Ayushman Bharat Digital Mission (ABDM) can further enhance access. However, digital inclusion requires capacity-building and literacy initiatives to ensure that older adults can effectively utilise technology-enabled health services.

INTEGRATING HEALTH AND SOCIAL PROTECTION SYSTEMS

The disintegration between healthcare and social welfare remains a defining weakness in India's ageing response. Policy consistency must be built through an integrated governance framework that unites health, social justice, rural development, and labour ministries under a shared ageing agenda. Adopting a “Health in All Policies (HiAP)” approach would ensure that ageing considerations are embedded across housing, transportation, and social security sectors.

At the service delivery level, meetings between NPHCE, IPOP, and pension schemes (IGNOAPS) can be institutionalised through common beneficiary databases, integrated referral pathways, and shared monitoring systems. District-level Elder Care Coordination Units could be operational hubs linking health facilities, welfare offices, and community organisations. International experiences such as Japan's Long-Term Care Insurance System and Thailand's Community-Based Integrated Care Model demonstrate strong local governance, dedicated financing, and precise accountability mechanisms. India offers similar potential if supported by adequate fiscal transfers and administrative capacity at the panchayat and municipal levels.

ADDRESSING EQUITY AND GENDER DIMENSIONS

Equity remains the ethical and policy cornerstone of any ageing strategy. As revealed in this review, older women, rural poor, and socially disadvantaged groups experience disproportionately lower access. Embedding gender-sensitive and equity-based planning in geriatric programmes can mitigate these disparities.

Pension schemes like IGNOAPS require enhanced benefit amounts and improved targeting. Expanding contributory and hybrid pension models to cover informal sector workers will be critical for long-term financial security. From a health equity perspective, investments should prioritise underserved rural and tribal regions, including mobile geriatric clinics and community outreach models.

Promoting social inclusion and participation of older adults through self-help groups, intergenerational programmes, and local councils can enhance mental well-being and civic engagement. Recognising the elderly's active contributors rather than dependents aligns with the Active Ageing framework [58], emphasising participation, health, and security.

CONCLUSION AND POLICY IMPLICATIONS

The ageing of India's population is no longer a distant prospect; it is a present reality that demands urgent policy attention. Older persons must be supported to survive and succeed with dignity, autonomy, participation, and good health. While India has made significant steps in articulating policy commitments for older persons, implementation remains irregular, fragmented, and insufficiently resourced.

The reviews pointed out that improving the well-being of the elderly in India depends on enhancing access to age-responsive health services, integrating fragmented health and social systems, and ensuring equity across socioeconomic and gender dimensions. Although policy frameworks exist, their impact is diluted by poor institutional coordination, insufficient financing, and low community participation. Addressing these challenges requires a multisectoral, equity-oriented strategy that repositions ageing as a public health and social development priority associated with the SDGs and the UN Decade of Healthy Ageing.

This paper suggests that meaningful progress will require shifting from isolated schemes to integrated health-social care systems. The review also bridges the gap between policy and practice. People must be regarded as assets rather than burdens, and ageing must be embedded in the mainstream of national development planning rather than treated as an afterthought.

If India is to achieve its international and national commitments regarding ageing, the time to act is now. With the right policy architecture, financial commitments, and community orientation, the ageing challenge can become an opportunity for inclusive growth, lifelong health, and inter-generational solidarity.

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PERSONAL HEALTH INDEX (PHI): AN AI-BASED APPROACH TO ATHLETE WELLNESS MONITORING

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ABSTRACT

The integration of wearable technology and artificial intelligence (AI) has opened new possibilities for personalized health monitoring. This article introduces the Personal Health Index (PHI), a proprietary metric developed to assess individual wellness using data collected from wearable devices. Implemented our institution. The PHI system has been in use since 2022 to monitor athletes across multiple sports. By leveraging AI to analyze physiological data, PHI provides actionable insights that support training, recovery, and overall health optimization.

KEYWORDS

Personal Health Index, Artificial Intelligence, Wearable Devices, Athlete Monitoring, Remote Patient Monitoring, VO₂ Max, Sleep Efficiency

INTRODUCTION

Wearable devices such as Fitbit and Apple Watch have become ubiquitous tools for tracking health metrics. Despite their popularity, the challenge remains in converting raw data into meaningful health assessments. The Personal Health Index (PHI) was developed to address this need by offering a comprehensive, AI-driven score that reflects an individual's overall wellness. This system is particularly valuable in athletic settings, where continuous monitoring and rapid feedback are essential for performance and injury reduction.

Wearable technology can track physical activity, sleep patterns, and heart rate, offering valuable data for health monitoring, although reliability may vary across different metrics and devices [1,2]. Piwek et al. [1] highlighted both the promises and limitations of consumer health wearables, emphasizing the need for better integration with clinical systems. Patel et al. [2] argued that wearables should be viewed as facilitators of behavior change rather than standalone solutions. Bunn et al. [3] reviewed the reliability of commercial wearable devices and found that while most devices were accurate in step counting, but variability existed in heart rate and sleep tracking.

In the context of athletic performance, wearable devices have been used to monitor training load, recovery, and cardiorespiratory fitness. Wang et al. [4] discussed the potential of wearable sensors for real-time health monitoring, while Kooiman et al. [5] evaluated the validity of ten consumer-grade activity trackers. Baig et al. [6] conducted a systematic review of wearable patient monitoring systems and identified key challenges in clinical adoption, including data privacy

and interoperability. The integration of AI into wearable health monitoring has further enhanced the ability to analyze large datasets and generate personalized insights [7].

Guidelines from the World Health Organization [8] and national health agencies [9] support the use of technology to promote physical activity and reduce sedentary behavior. Thompson [10] reported that wearable technology continues to be among the top global fitness trends, indicating widespread acceptance and potential for impact. A recent report on cheerleading illustrated the use of AI in athletic monitoring reflecting a broader trend of leveraging advanced technologies to optimize athletic performance and monitoring across diverse disciplines [11].

METHODS

The PHI system can collect data from a range of devices including smartwatches, pulse oximeters, weight scales, heart rate monitors, and blood pressure cuffs. Metrics monitored include sleep efficiency, body mass index (BMI), VO₂ max, step count, and active minutes. A custom mobile application synchronizes with wearable devices, automatically retrieving and analyzing daily wellness data. The AI algorithm processes this data to generate a daily PHI score, which is used to guide training and health decisions.

The development and implementation of the PHI followed a structured methodology, combining wearable technology integration, data analytics, and field testing. Initially, a set of physiological metrics was identified based on relevance to athletic performance and general wellness. These metrics included sleep efficiency, BMI, VO₂ max, step count, and active minutes. Data was collected using commercially available such as Fitbit and Apple Watch, supplemented by pulse oximeters, weight scales, heart rate monitors, and blood pressure cuffs.

A custom mobile application was developed to synchronize data from these devices and transmit it to a secure server. The AI algorithm was trained using historical data to generate a personalized PHI score. The system was piloted with athletes from the University of North Florida (UNF), and feedback was collected to refine the algorithm and user interface. This study was approved by the UNF Institutional Review Board (protocol code IRB#1970666-2, date: 18 January 2023), and all participants provided written informed consent before participating in this study.

Statistical analysis, including Mann-Whitney U tests and Spearman's rank correlation, was used to investigate the relationships between PHI scores and performance metrics.

AI MODEL TRAINING AND VALIDATION

The accuracy and reliability of the PHI score depend on the robustness of the underlying AI model. The model is trained using a large dataset of physiological metrics collected from wearable devices. Data preprocessing includes normalization, outlier detection, and feature selection to ensure high-quality inputs. The model employs supervised learning techniques, with labeled data indicating wellness levels based on expert assessments and historical performance. Validation of the AI model involves cross-validation and testing on independent datasets to assess generalizability. Performance metrics such as precision, recall, and F1-score are used to evaluate the model's effectiveness. Continuous monitoring and retraining are conducted to adapt to new data and improve accuracy over time. Transparency in model development and validation is critical to building trust among users and stakeholders.

RESULTS

Since its launch in 2022, the PHI system has been adopted by several athletic teams at UNF. Basketball, Soccer, Track & Field, Tennis, Volleyball, Softball, and Cheerleading teams have been monitored. With 17,631 records, using Spearman's rank-order correlation, five variables were analyzed. The number of daily steps, sleep efficiency, and active minutes were positively correlated with an athlete's PHI. BMI and VO₂Max were not strongly correlated to the daily PHI.

FIGURE 1: CORRELATION OF METRICS COLLECTED ON ATHLETES WITH PHI USING SPEARMAN'S RANK-ORDER CORRELATION.

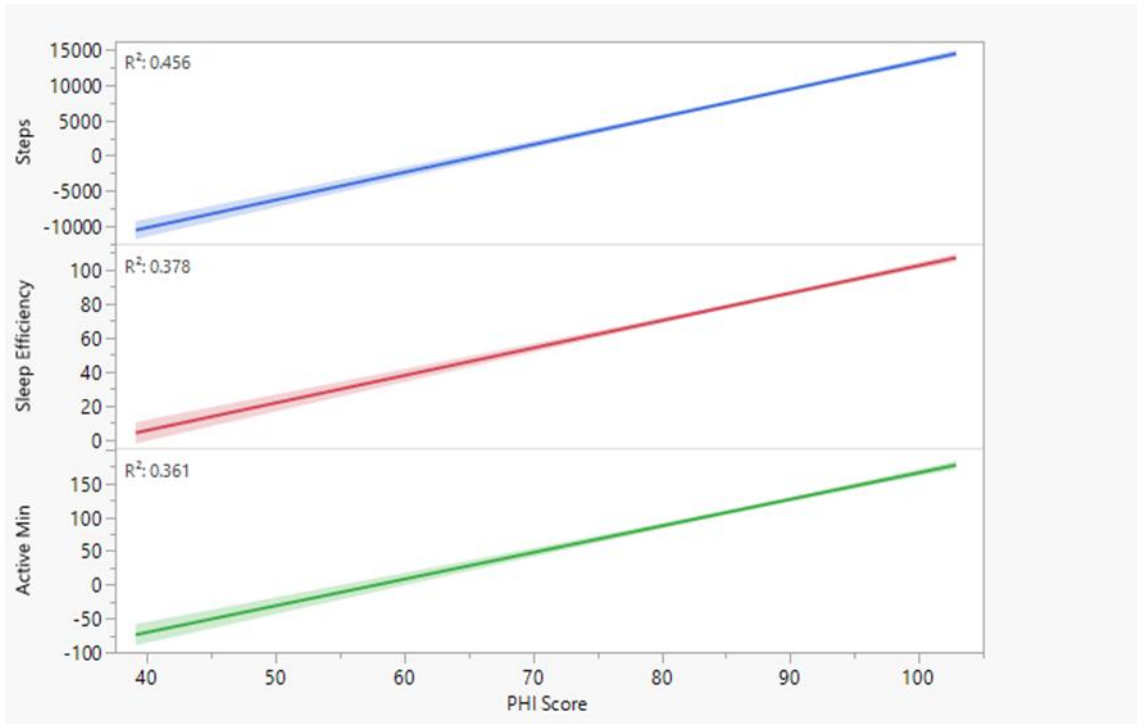
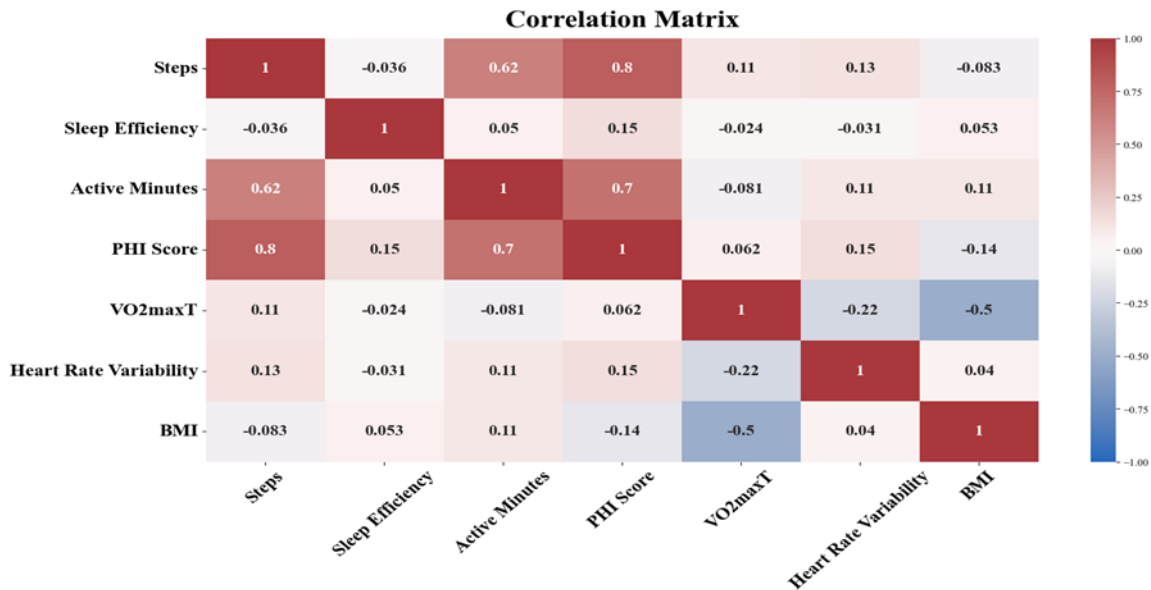


Figure 2 illustrates the correlation between the PHI score and its constituent metrics across data collected for all sports. Daily number of steps, sleep efficiency, and active minutes were strongly correlated with the daily PHI score.

FIGURE 2: CORRELATION MATRIX FOR ALL SPORTS USING SPEARMAN'S RANK CORRELATION COEFFICIENT



DISCUSSION

The PHI system offers several advantages, including efficient health monitoring, early risk detection, and personalized recommendations. It provides a validated daily health score that can be used by athletes, coaches, and healthcare providers to make informed decisions. The system also enables multivariate analysis of health metrics, identifying strong correlations between activity levels, sleep quality, and overall wellness [2,3]. Beyond athletics, PHI has potential applications in fitness centers and general population health monitoring [4,5]. Its ability to integrate diverse data streams positions it as a valuable tool for preventive care and personalized health strategies. As wearable technology and AI

continue to evolve, systems like PHI could play a pivotal role in bridging the gap between consumer health data and clinical decision-making.

The PHI system is poised for expansion beyond collegiate athletics. Future enhancements include integration of in-game statistics and GPS data to correlate physical performance with health metrics. Development of team and individual dashboards will allow coaches and athletes to visualize trends and make informed decisions. Additionally, the system may be adapted for use in fitness centers, corporate wellness programs, and general population health monitoring. Research partnerships and longitudinal studies will help validate the PHI score across diverse demographics. The goal is to establish PHI as a standard tool for personalized health assessment and proactive wellness management.

Future research on the Personal Health Index (PHI) should focus on several key areas to enhance its utility and impact. First, large-scale longitudinal studies are needed to evaluate the long-term effects of PHI-guided interventions on health outcomes across diverse populations. These studies should include both athletic and non-athletic cohorts to assess generalizability. Second, research should explore the integration of PHI with electronic health records (EHRs) to facilitate seamless data exchange between personal monitoring systems and clinical workflows. This would enable healthcare providers to incorporate PHI scores into routine care and decision-making. Third, further development of the AI algorithm is essential, including the use of advanced machine learning techniques such as deep learning and reinforcement learning to improve predictive accuracy and personalization. Additionally, studies should investigate user engagement strategies, including gamification and behavioral nudges, to promote sustained use of the PHI system. Finally, ethical and policy research is needed to address concerns related to data privacy, algorithmic bias, and equitable access to wearable health technologies. By addressing these areas, future research can ensure that PHI evolves into a robust, inclusive, and clinically valuable tool for health monitoring and management.

While these research priorities will shape PHI's evolution, translating them into practice requires a structured implementation strategy. Successful implementation of the PHI system requires a multi-faceted approach that includes stakeholder engagement, infrastructure readiness, and training. Institutions should begin by identifying key personnel such as athletic trainers, IT specialists, and healthcare providers who will oversee deployment. Infrastructure must support secure data transmission and storage, and wearable devices must be compatible with the PHI platform. Training programs should be developed to educate users on device usage, data interpretation, and response protocols. Pilot testing and phased rollouts can help identify challenges early and ensure smooth integration. To evaluate the effectiveness of PHI, comparative studies should be conducted against existing health monitoring tools. Metrics such as user satisfaction, health outcomes, and cost-effectiveness can be used to assess performance. For example, PHI can be compared with traditional fitness assessments or manual tracking methods. Preliminary findings suggest that PHI offers superior real-time feedback and personalized insights, which may lead to improved adherence and outcomes. Further research is needed to validate these advantages across different populations and settings.

To complement these research efforts, incorporating user feedback helps refine functionality and address real-world challenges. User feedback is essential for refining the PHI system and ensuring it meets the needs of diverse users. Surveys and interviews with athletes, coaches, and healthcare providers can provide insights into usability, accuracy, and impact. Common themes include appreciation for the simplicity of the PHI score, desire for more customization options, and concerns about data privacy. Feedback should be systematically analyzed and incorporated into iterative design updates. Engaging users in the development process fosters trust and improves adoption.

Incorporating user feedback not only improves usability but also informs the adaptations needed for successful scaling across diverse contexts. The scalability of PHI to global contexts depends on its adaptability to different healthcare systems, cultural norms, and technological infrastructures. Localization of the app interface, language support, and integration with regional health databases are critical for international deployment. Partnerships with global health organizations and academic institutions can facilitate cross-border research and implementation. By addressing barriers such as device affordability and internet access, PHI can become a valuable tool for global health monitoring and equity.

CONCLUSION

The Personal Health Index represents a significant advancement in digital health and sports science. By combining wearable technology with AI analytics, PHI transforms raw data into meaningful insights that support wellness and performance. Its successful implementation at UNF demonstrates its value in athletic settings and its potential for broader application in personal and community health initiatives [6,7].

Healthcare professionals and athletic trainers can leverage the PHI system to enhance patient and athlete monitoring. By integrating wearable technology into routine assessments, practitioners can obtain real-time insights into an individual's health status. The PHI score simplifies complex data into a single metric, facilitating quick decision-making.

Practitioners should encourage consistent device usage and educate users on interpreting their PHI scores. In cases of moderate or high risk, timely interventions such as consultations, diagnostic testing, or treatment plans can be initiated. Collaboration with exercise science departments can further enrich the monitoring process by incorporating academic research and performance analytics.

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STAFF AND SURVEYOR TRAINING IN LOW- AND MIDDLE-INCOME COUNTRIES AS AN ENABLER FOR HOSPITAL ACCREDITATION AND VALUE-BASED HEALTHCARE

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ABSTRACT

OBJECTIVE:

To examine the context of Hospital Accreditation Programs (HAPs) in Low- and Middle-Income Countries (LMICs): 1) training of health staff; 2) training and professional development for accreditation surveyors.

DESIGN:

Qualitative study

SETTING:

Thirty purposively selected representatives from national HAPs and international accreditation and funding agencies were interviewed using a semi-structured guide.

MAIN OUTCOME MEASURES:

Methods, importance, competencies, challenges and innovative strategies of training health staff and surveyors in HAPs in LMICs

RESULTS:

Staff competencies are important for quality improvement (QI) and maintaining organisational and quality culture. Innovative strategies included training of internal assessors and initial pre-assessment training. Maintenance of competencies amidst staff turnover was reported as a major challenge. Surveyor training usually includes in-person didactic training, practical skills-based experiential training, observation of surveys, and refresher training. Required competencies were based on facilitating QI, assessment methodologies, and report writing. Reported challenges were a lack of time for training. Innovative strategies included virtual training and annual conferences.

CONCLUSIONS:

Training of staff and surveyors is an important component of effective and viable hospital HAP implementation in LMICs. Global programs follow comparable strategies for staff and surveyor training. This research has identified several innovative strategies, which could be further developed, evaluated and disseminated.

KEYWORDS

Value-based care, hospital Accreditation, Quality and Patient Safety, Health Staff Training, Accreditation Agency Surveyor Training, Low- and Middle-Income Countries, Qualitative Study

INTRODUCTION

The concept of Value-based healthcare originated in the 1990s and is still important in the current context, as it ensures balance between quantity, cost and quality of services [1]. Value-based healthcare focuses on maximising the value of care for patients and reducing the cost of healthcare [2], and the value of care is defined as patient-relevant outcomes, compared to the costs per patient across the full cycle of care to achieve these outcomes [3].

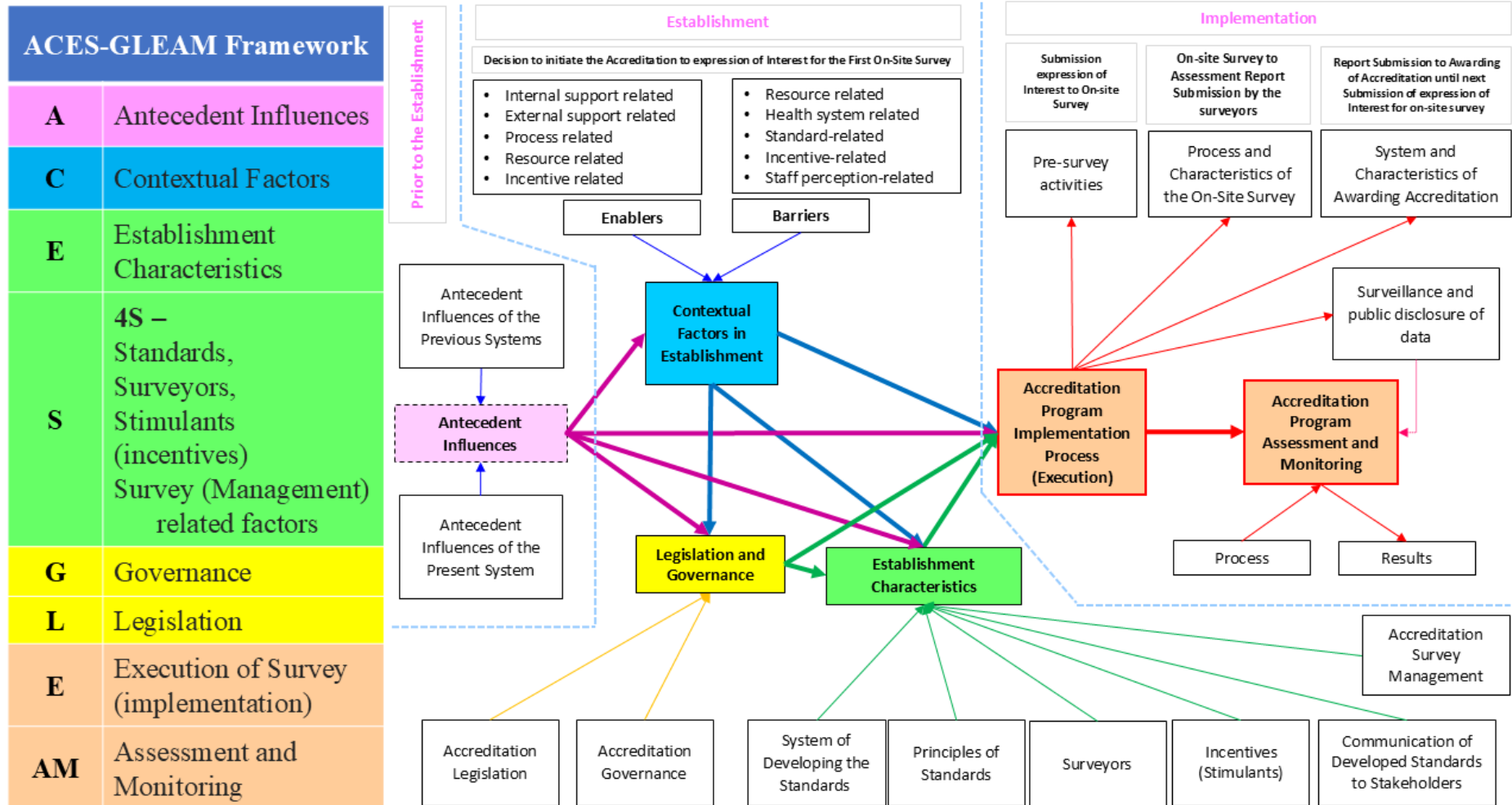
Value-based healthcare is imperative in Low- and Middle-Income Countries (LMICs), as these countries need to ensure patient safety and quality with minimal use of resources. These resource-constrained settings have a high burden due to poor quality and patient safety. The recent Global Patient Safety Report – 2024, World Health Organisation (WHO), reported that there were 134 million adverse event incidents, contributing to 2.6 million deaths per year in LMICs [4]. Hospital accreditation programs (HAPs) can ensure value-based healthcare by continuously improving healthcare systems and assessing their performance. They also have the ability to transform hospitals to improve quality and patient safety, thus contributing to value-based healthcare.

HAPs are composed of complex interrelationships of multiple domains, as outlined in the ACES-GLEAM Framework (Figure 1) [5]. Initially, antecedent influences impact the establishment of HAPs. Thereafter, legislation and governance systems influence the establishment. The subsequent establishment and implementation comprised four main components, i.e., Standards, Surveyors, Stimulants, Survey Management, with communication of standards. These components will mediate the implementation of HAPs, and program assessment and monitoring are important components of a HAP. All domains are affected by contextual factors, either as enablers or barriers [5].

During the process, surveyors and health staff are important internal stakeholders of HAPs, and improving their competencies is imperative to the successful and sustainable establishment of HAPs [5, 6]. Health staff are important for the implementation of standards in their hospital settings [7, 8]. Surveyors are important in assessing hospitals in relation to compliance with standards as external evaluators [9, 10].

This research note presents a synthesis of insights of global stakeholders in relation to the importance, methodologies, required competencies, challenges and innovative strategies of training for health staff and surveyors in the implementation of HAPs in LMICs. It is a preliminary reflection, from a comprehensive exploration of insights generated from global stakeholders to elicit contributory factors for the establishment, implementation, success and sustainability of HAPs in LMICs.

FIGURE 1: ACES-GLEAM FRAMEWORK [5]



METHODS

A qualitative cross-sectional study was conducted using interviews with 30 purposively selected key informants. Fifteen key informants from national accreditation agencies from five WHO regions were interviewed (Eastern Mediterranean Region – 4; African Region – 4; South-East Asian Region – 3; Western Pacific Region – 3; Region of the Americas – 1). Additionally, 11 participants from international accreditation agencies who are operating in more than one country and four participants from multi-national agencies, who are providing technical and financial assistance to HAPs in LMICs, were also interviewed.

A semi-structured interview guide was used, which was developed based on the previously described ACES-GLEAM Framework [5] and validated using Sri Lankan healthcare administrators. Data collection was done in January and February 2025 by the first author. Thematic analysis was done by the first author and validated by the co-authors. Ethics approval was granted by the Griffith University Human Research Ethics Committee.

RESULTS

Results were initially classified into themes related to accreditation surveyors and health staff. Subsequently, five sub-themes were identified within each of the two themes, i.e., methods of training, importance of training, required competencies, challenges and innovations.

HEALTH STAFF TRAINING

Training of health staff is required to ensure clear and consistent communication of the aims and requirements of accreditation standards, especially during revisions. Sub-themes, codes and selected quotes are depicted in Table 1.

TABLE 1: SUB-THEMES, CODES AND SELECTED QUOTES IN RELATION TO THE THEME OF HEALTH STAFF TRAINING

| Sub-theme | Code | Selected Quotes |
|------------|--|--|
| Methods | Assessment Linked with Support to meet Recommendations | <i>....by providing a lead assessor to work as a consultant, as a quality partner to guide and coach and provide support as to how are you going to meet those recommendations..." (AA-02)</i> |
| | Done by a Consultation / Training Division of the Accreditation Agency | <i>"We established another sort of sister company or arm that advises on quality and patient safety using accreditation And we would help them in training their um employees ..." (GA-02)</i> |
| | Done by an External Agency to the Accreditation Agency | <i>"Organisations like ours conduct a lot of training programs, which is where [Agency] comes into the picture, though we are not directly connected with [Accreditation Agency], we realise there is a gap in the [Accreditation Agency] training..." (GA-03)</i> |
| | Need to separate the processes of training and accreditation | <i>"...We do provide consultancies, but we ensure that we have firewall the consultancies from the assessment, so the person does, the consultancy cannot go and do the assessment....." (AA-08)</i> |
| Importance | Communication of Standards to Staff | <i>".....We had from 5th edition to the 6th edition is being launched So the [Training Agency] will also take a kind of training and sensitising programs to sensitise hospitals about the 6th edition...." (GA-07)</i> |

| Sub-theme | Code | Selected Quotes |
|--------------|---|---|
| | Sensitising Staff on the Importance of Accreditation | "Through education through marketing, this top management, people in the hospital will really consider accreditation as important....." (GA-09) |
| | Awareness of the Intent of Implementing the Standards | "...and there is a lot more capacity building that is needed in the country in order to implement our goal, which is patient safety and quality, so for us, this is very important that people understand the right intent...." (GA-03) |
| | Overcoming the resistance to change through improving awareness | "... First few awareness programs, people walked out this is a western concept...You cannot have quality and quantity linked together...This quality is going to cost a lot of money... We formed a team and went for every nick and corner to bring in awareness..." (GA-14) |
| Competencies | Standards | "We normally first sensitise the leadership, to the methodology and for them understanding the standards then now we get go down to the middle level and another training to really unpacking the standards for them...." (AA-02) |
| | Quality Improvement | "... at the county level. We have a quality improvement coordinator...the one that is responsible for improvement initiatives, ...in every service area, they come up with work improvement teams...they identify gaps and then they do what you call use PDSA..." (GA-13) |
| | Policies and Procedures of Accreditation | "So if for example, they may not had fully understood with what certain policies or procedures what the particular requirements are, or another common example is and specifically related to quality improvement ...then you'll find with the Technical Support services..." (GA-02) |
| | Quality Culture | ".... again to develop a culture to learn from the errors...Is again a very important thing..... And so the various mechanisms must be thought about whether there are webinars or training programs or there are, you know, sensitization of different departments..." (GA-07) |
| Challenges | Maintenance of Competencies amidst Staff Turnover | "then secondly, is the turnover in the, in the health facilities in the counties because you need to train people on this, it's a new way of doing things. So, you would train and then. After a while, people, there's memory loss...." (AA-02) |
| | Poor Participation | "So, you have a very small group where the training or the activity where its support activity was intended for 20 participants, and you only have 10 people. I'm arriving and that kind of I think also hinders the progress and the expected outcome...." (AA-05) |
| | Quality, Safety and Accreditation were not a part of Basic Training | "Quality of care is something that has for us, who went to medical school a while ago. It was never discussed in medical school, so many people in the health facilities don't see, don't understand the concept of quality of care,..." (GA-02) |

| Sub-theme | Code | Selected Quotes |
|-------------|--|--|
| Innovations | Pre-assessment Training after Self-assessment and Gap Analysis | ".... So, we do first the self-assessments, then we do the gap analysis. then we do the training and the capacity building. So, we do that focused or based on our gap analysis..." (AA-01) |
| | Certification Courses on Quality and Safety | "Particularly for quality management, risk management and infection prevention leadership, we have different courses and certification courses to empower the people working in healthcare..." (GA-02) |
| | Training of Internal Assessors or Quality Advisors | "We train internal assessors so that they will know on how to comply the standards.... only facilitate their hospital to comply with the standards, but they are not our employees. " (GA-09) |
| | Virtual or Remote Training | "...So, during COVID and so learnt a lot about remote training and how to help people with that and in interesting we now do our standards training remotely ..." (AA-08) |

Participants reported that staff training is usually embedded within the assessment and post-assessment of hospitals. Accreditation agencies usually support hospitals in meeting recommendations after the accreditation assessment. However, some agencies have a consultancy division to provide pre-assessment training, and in some countries, there are separate training agencies to conduct training. In either case, participants reported that there should be a firewall to separate the processes of training and accreditation assessments, to avoid conflicts of interest.

Staff training is important mainly to communicate details of standards to hospital staff, as mentioned by participants. Additionally, it is important to sensitise staff on the importance of accreditation and be aware of the intent of implementing standards, to avoid adhering to standards and accreditation blindly as an opportunistic process. According to study participants, training and awareness of staff will contribute to overcoming resistance to change.

Participants highlighted that training is mostly important to instil competencies on accreditation standards. Additionally, competencies related to quality improvement, policies and procedures of accreditation and quality culture are also important ones that are intended to be imparted through staff training.

The main challenge reported was maintaining staff competencies amidst frequent staff turnovers and poor participation in training. Notable and interesting quotes mentioned by a few participants were related to not having quality, safety and accreditation incorporated within basic training of health professionals.

The following innovations were mentioned by participants in relation to staff training. Usually, accreditation agencies conduct training during or after the conduct of the accreditation assessment. However, some agencies conduct training based on a gap analysis between self-assessment and formal assessment, before having training during the assessment or post-assessment. Additionally, the conduct of certification courses on quality and safety, training of hospital staff as internal assessors or quality advisors and virtual training modalities were reported as innovative strategies, employed by HAPs in LMICs.

ACCREDITATION AGENCY SURVEYOR TRAINING

Training of accreditation agency surveyors was conducted as induction and refresher training of accreditation surveyors to enable reliable and unbiased assessments. Sub-themes, codes and selected quotes relevant to this theme are depicted in Table 2.

TABLE 2: SUB-THEMES, CODES AND SELECTED QUOTES IN RELATION TO THE THEME OF ACCREDITATION AGENCY SURVEYOR TRAINING

| Sub-theme | Code | Selected Quote |
|--------------|---|--|
| Methods | In-person Didactic Training | "....5-day training session, face-to-face, where they do cover the standards...." (AA-03) |
| | Practical Skills-based Experiential Training | "The next day we're in the departments.... we train as we do, so, you feel the actual assessment process..." (GA-01) |
| | Participation in Surveys as Observers | "After we recruit them and train them, theoretical and practical, we offer for them to observe a survey and..." (GA-05) |
| | Follow up with Refresher Training | "...During those two years, there are a number of minimum requirements that they have to achieve, which include continuous professional development trainings, a number of accreditations that they have to participate in..." (GA-10) |
| Importance | Assessing against Standards and Verifying Accreditation Status | ".... check if these organisations attained or not attained the standards...." (GA-04) |
| | Enhances the Image of the Accreditation Agency and the Credibility of the Program | "If they are good, competent, trained, and professional, there will be a good image and can enhance the credibility of our program..." (GA-05) |
| | Survey Reliability related to Competency | "It [survey] depends upon the person.... It's that skill and different person ... and that is the challenge..." (GA-09) |
| | Facilitate a Cycle of Improvement through Findings and Recommendations | "...how they put a good findings recommendation So, all the time it's about a cycle of improvement..." (GA-05) |
| Competencies | Theoretical Knowledge on Standards and the Program | ".... Theoretical one to know the requirements of our program, the standards and Code of conduct, laws and regulations..." (GA-05) |
| | Methodology of Assessment and Report Writing | "...go through accreditation methodology, how to conduct accreditation, how to interview people, how to write, report, how to raise a non-compliance, how to talk to the hospitals..." (GA-03) |
| | Support Facilities for Quality Improvement | "...it shouldn't be just an assessment. It should be an assessment including.... guiding the health facilities to do quality improvement. " (GA-01) |
| Challenges | Lack of Time for Training for Existing Health Professionals | "...That but number one challenge is there is they have to attend the training program if they have time ..." (GA-09) |
| | Lack of Surveyor Time for Maintaining | ".....However, they are not available because they are not full-time staff. They are part-time and usually do not |

| Sub-theme | Code | Selected Quote |
|-------------|--|---|
| | Competencies, as Surveyors are Part-time | <i>provide us with many days. They are not available. they only provide us with a minimum number of days required for recertification..." (GA-02)</i> |
| | Limited Attention to Continuous Professional Development | <i>"..... It [CPD] is almost like a self-learning thing, but there are refresher things happening on and off one hour, 2 hours. It's not enough. " (GA-03)</i> |
| Innovations | Virtual Surveyor Training Programs | <i>".... We developed an online surveyor training program for them. So they can now repeat that program....." (AA-01)</i> |
| | Annual Conferences | <i>"we run large scale conferences so that they can understand what's going on in the world of quality and patient safety, accreditation ..." (GA-10)</i> |
| | Unpaid (Free) Training | <i>"..... It's not a paid training Because if you make it a paid training, anyone who have money they can join the training.... " (GA-05)</i> |
| | ISQua Accreditation | <i>"Because our surveyor programme is ISQua accredited as well, we follow the strictest ISQua guidelines ..." (AA-08)</i> |

According to participants, the surveyor training process is generally initiated with in-person didactic training. This was followed by practical skills-based experiential training with a mentor. Thereafter, trainee surveyors will participate in surveys as observers and will be recruited as surveyors. These training courses will be followed up with annual refresher training to maintain their competencies and to raise their awareness about new developments in standards and HAPs.

Participants highlighted that surveyors are an important element in assessing hospitals against standards and verifying accreditation status. Additionally, they enhance the image of the agency and the credibility of the program, as the reliability of surveys is directly related to their competencies. Moreover, they are important to facilitate quality improvement in healthcare institutions through their survey recommendations.

Participants reported that accreditation surveyors require the following competencies: The most prominent is theoretical knowledge of standards. Additionally, competencies in methodology of assessment, report writing skills, and finally, skills required to support facilities for quality improvement are also important.

The main challenge for surveyor training, as reported, was the lack of time to participate in training programs, as most surveyors were currently working as health professionals. Additionally, the lack of surveying time for part-time and volunteer surveyors to maintain their competencies and limited attention to continuous professional development were other main reported challenges.

Innovations mentioned by participants were virtual training, annual conferences held for continuous development, and providing surveyor training without any payment from the prospective participants. ISQua accreditation of surveyor training programs was the most recognisable innovation employed by HAPs in LMICs.

DISCUSSION

STATEMENT OF PRINCIPAL FINDINGS

This study identified the importance of health staff and accreditation agency surveyors in achieving value-based care through supporting the effective and sustainable establishment and implementation of HAPs in LMICs. Health staff training programs targeted at improving awareness, meeting recommendations, and imparting quality improvement, which are linked with accreditation. HAPs used pre-assessment training and training of hospital staff as internal assessors as innovative

strategies. Accreditation surveyor training had comparable strategies (didactic, experiential, on-the-job, and refresher training) and similar required competencies (accreditation standards and methodology, and quality improvement) across national and international settings. However, there were challenges in implementing such programs, which warrant innovative strategies, such as virtual training.

STRENGTHS AND WEAKNESSES

The study has incorporated insights from participants from different settings who were directly involved with HAPs in LMICs, either nationally or internationally, through their accreditation, technical and funding agencies. Importance, methods, challenges, competencies, and innovations of health staff and surveyor training programs were identified through this study.

Similar to this study, many global studies have recognised the importance of health staff training for effective and sustainable implementation of HAPs in LMICs [5, 11-16]. Accordingly, the International Society for Quality in Healthcare (ISQua) has recently published guidelines for staff training on quality and patient safety [17]. Despite having similar ISQua guidelines for surveyor training [18] and being recognised through this study, only limited studies and reviews highlight the importance of surveyor training programs, even at the global level [6, 13, 15, 16, 19, 20].

This study reported that health staff need skills in relation to standards, quality improvement and accreditation processes, as they are involved in the basic pathway of achieving accreditation, which was reiterated in international literature [11-13, 21]. Similarly, quality improvement competencies were targeted across surveyor training programs in HAPs, as reported in our study, as well as in international literature [5, 22, 23], as surveyors were expected to facilitate quality improvement during the accreditation surveys [22]. Consequently, accreditation-related concepts such as standards, assessment methodologies, and policies and procedures of accreditation are important competencies for surveyors [24].

Poor participation in staff training and maintaining competencies amidst frequent staff turnover were reported as the main challenges of staff training in both our study as well as international studies [11, 12]. Continuous professional development and maintenance of competencies are important concepts in training [25], which was reported as a challenge for surveyor training in our study. However, maintaining surveyor competencies due to poor attention to refresher training was not recognised in contemporary accreditation-related literature.

Participants suggested several innovations to overcome these challenges in our study. The main reported innovation in staff training was pre-assessment training of health staff using internal or external surveyors, which was incorporated in a few selected programs in HAPs in LMICs [5, 24, 26]. Virtual surveyor training was the most common innovation reported in our study. It was able to address low participation, poor refresher training, and maintain competencies amidst the high turnover of surveyors. However, virtual surveyor training was limitedly reported in global accreditation literature, despite being used extensively for global training programs [27].

This study has several limitations due to the utilisation of a qualitative study design. Purposive sampling may have introduced a selection bias, which was minimised through the use of a wide range of participants. Data saturation through iterative data analysis was not possible due to the global scale of the study and related limited networking opportunities. Interviews were conducted in English, which may have limited the expressions of non-native English-speaking participants.

IMPLICATIONS OF THE STUDY

Staff and accreditation agency surveyor training has gained due prominence in HAPs in LMICs and globally due to the availability of ISQua guidelines. However, the study has identified a few challenges of staff and surveyor training, i.e., limited participation in training, lack of refresher training, and maintaining competencies amidst increased staff and surveyor turnover. By the utilisation of virtual training modalities, all of these aforementioned challenges could have been averted. The other notable innovation, pre-assessment staff training, should be promoted among HAPs in LMICs, as it will be an opportunity for preparing hospitals for prospective accreditation surveys in a step-wise manner, amidst resource constraints.

CONCLUSION

This study elicited key insights of national and international accreditation stakeholders on key components attributed to health staff and accreditation agency surveyors. Global accreditation programs had comparable strategies, challenges, and required competencies for staff and surveyor training. These training programs are important components of HAPs in LMICs to make them effective and sustainable, and subsequently to ensure value-based care. This research has identified several innovative training strategies employed by different accreditation programs in LMICs, some of which are important strategies for resource-constrained settings. These innovative training strategies could be further developed, evaluated and disseminated to enhance the implementation of accreditation programs and improve quality and safety with minimal cost and resources.

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DEVELOPMENT AND FORMATIVE EVALUATION OF AN INNOVATIVE NATIONAL NEAR-MISS REPORTING SYSTEM FOR CURATIVE HEALTHCARE INSTITUTIONS IN SRI LANKA

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ABSTRACT

BACKGROUND

Near-misses are errors that have the potential to cause an adverse event but fail to do so because of chance or because they are intercepted. By 2021, Sri Lanka had only established systems for maternal and blood transfusion services.

METHODS

A new holistic near-miss reporting system was developed and piloted at a large tertiary hospital in 2022 to guide subsequent nationwide implementation. During the pre-interventional phase, national-level consultative meetings (n=20), key informant interviews (n=10), and focus groups (n=22) were convened with purposively selected representatives of professional colleges, academia, medical administrators, and senior staff of the participating hospital to identify existing methods of reporting near-misses. A near-miss reporting format and guidelines were designed with input from national-level consultative meetings. Training on the new system for medical and nursing officers, periodic reminders to staff, and dissemination of preventive measures for patient safety incidents were implemented as interventions. A pre-post evaluation was conducted to identify the effect of the new system and stakeholders' views on the potential for nationwide implementation.

RESULTS

Eight near-misses were reported three months following implementation, compared to none prior to implementation. Study participants expressed satisfaction with the new system's user-friendliness, clarity, non-punitiveness, voluntary nature, and confidentiality protection. The system was perceived to be suitable for national implementation following refinements.

CONCLUSIONS

This evidence-based near-miss reporting system, combined with the complementary activities implemented in the pilot setting, should now be introduced into additional hospitals before national implementation to further enhance its design, support from stakeholders, and quality and safety impact.

KEYWORDS

Quality Improvement, patient safety, healthcare near-misses, near-miss reporting systems, intervention study, low- and middle-income countries

INTRODUCTION

The World Health Organization (WHO) defines a near-miss as an error that has the potential to cause an adverse event (patient harm) but fails to do so due to chance or because it is intercepted [1]. There is a relationship between adverse events and near-misses because, according to Heinrich's Law, "for every adverse event, there are 30 minor injuries and 300 near-misses." [2]. Near-misses are considered red flags for future adverse events, offering an opportunity to analyse and address causal factors [3].

Most high-income and several middle-income countries have implemented national-level near-miss reporting systems that routinely collect relevant data from hospitals [4]. However, recent research identified a few countries in the South and Southeast Asian regions with these systems in place [5]. Sri Lanka does not have a comprehensive, holistic national-level near-miss reporting system other than for the specific issues of maternal near-misses (managed by the Family Health Bureau (FHB) and near-misses related to blood transfusion (managed by the National Blood Transfusion Services (NBTS) [6]. Limited research has been conducted regarding near-misses in Sri Lanka, confined solely to maternal near-misses [7].

This interventional study, supported by the Sri Lankan Ministry of Health, had the following objectives: 1) explore gaps in the current issue-specific near-miss reporting systems; 2) use this information to develop a more comprehensive, holistic, and effective system; and 3) encourage healthcare professionals to report near-misses and take actions to prevent their recurrence in the future. The overarching aim was to strengthen the structures and processes used for reporting near-misses in Sri Lanka and, in doing so, advance the national quality and safety agenda.

METHODOLOGY

This study was conducted in three phases: pre-interventional, interventional, and post-interventional. Several qualitative research methods were used during the pre-and post-interventional phases. Ethical clearance was obtained from the Ethics Review Committee, Post Graduate Institute of Medicine, University of Colombo. Permission to carry out the project was obtained from the Ministry of Health, Deputy Director General – Medical Services I, Director- Directorate of Healthcare Quality & Safety (DHQS), Director- FHB, Director -NBTS, Provincial Director of Health Services – Western Province, Regional Director of Health Services – Colombo and the Head of the Institution of DGH Avissawella.

The study was conducted from February 2022 to December 2022 in the District General Hospital (DGH) – Avissawella, the only District General Hospital in Colombo district- the capital of Sri Lanka. The hospital comprises all major specialties, theatre, and ICU facilities, and almost all sub-specialties that a District General Hospital should have [8]. Considering the service availability, practical feasibility, and administrative support for implementation, the research team selected the site mentioned above to pilot the project.

PRE-INTERVENTION PHASE

The two existing, topic-specific near-miss reporting systems and adverse event/incident reporting systems were critically analysed during the pre-intervention phase. Consultative meetings, key informant interviews (KIs), and focus group discussions (FGDs) were conducted by the principal investigator (PI) using semi-structured guides until theoretical saturation was achieved [9]. Study tools were validated through input from officials from DHQS, and pre-testing was undertaken with FHB and NBTS staff. These guides were designed to extract information from purposively selected participants about their perceptions and opinions about near-misses, near-miss reporting, key barriers, and recommendations for developing and implementing a national reporting system.

An initial consultative meeting was held with a purposively selected sample of 20 representatives from prominent professional colleges and academic centres, e.g. Sri Lanka College of Surgeons, Sri Lanka College of Obstetricians and Gynaecologists, Sri Lanka College of Anaesthesiologists, Sri Lanka College of Physicians, Sri Lanka College of Paediatricians, University of Colombo, etc.

These representatives, who were specialist medical officers in several specialties, were from different hospitals in different geographical areas in the country. Since they were experienced senior specialists, they possessed a clear understanding and knowledge about the near-misses that occur in their units.

Kills were held with the present and two previous Directors of the DHQS, the National Programme Manager of the Maternal Morbidity/Mortality Surveillance Programme of the FHB, the Head of the Hemovigilance Unit – NBTS, and three purposively selected heads of the institutions and two Special Grade Nursing Officers (SGNO) (equivalent Chief Nursing Officers) of DGH Avissawella. FGDs were held with eight Consultants (Group 1) and 14 Nursing Sisters and Unit in-charge Nursing Officers (Group 2) of DGH Avissawella.

INTERVENTION

A process map, then Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, was completed to identify bottlenecks in reporting systems and pragmatic methods available to strengthen current systems. The outcomes of these analyses are presented in Figure 1. Based on the gaps identified in the pre-intervention phase, the following interventions were agreed upon by the project team:

- refinement of existing process and systems for near-miss reporting.
- development of guidelines to facilitate near-miss reporting; and
- the design of a user-friendly near-miss reporting format.

The results, in combination with key findings elicited through a desktop, non-systematic scan of the peer-reviewed literature, were used to design a draft near-miss reporting form and guidelines, which were reviewed and finalized with input at the second and the third national-level consultative meetings. These were held with the participation of the Director - DHQS, representatives from purposively selected professional colleges and academia (as mentioned above), and purposively selected hospital administrators who are well experienced in health care management in different levels of hospitals in different areas in the country.

Conduct of training programmes

Training programs were conducted for medical and nursing officers to improve their knowledge and alleviate negative perceptions about near-misses and near-miss reporting processes. During these programs, the newly designed near-miss reporting form and guidelines were introduced to the medical officers and nursing officers of the hospital.

Changes to structures and processes

An internal circular signed by the Director about the near-miss reporting process was distributed among the units by the Nursing Officer (NO) – Quality Management Unit (QMU) with a folder containing the near-miss reporting forms and the national guideline. The in-charge nursing officers were instructed to keep the folder accessible to any health care worker (HCW). Details of the intervention were shared in the social media groups of HCWs and conveyed by the head of the institution during consultant meetings and unit in-charge meetings. A near-miss reporting form box was established in front of the QMU to drop the completed forms confidentially. Fortnightly reminders about near-miss reporting were shared in staff social media groups, and periodic feedback was provided at consultant meetings and in-charge meetings to improve reporting.

FIGURE 1 SWOT ANALYSIS OF THE EXISTING NEAR-MISS REPORTING SYSTEMS AND ADVERSE EVENT / INCIDENT REPORTING SYSTEM IN SRI LANKA

| <u>Near-miss Reporting System</u> | |
|---|---|
| <p style="text-align: center;"><u>Strengths</u></p> <ol style="list-style-type: none"> 1. Already established near-miss reporting systems to report maternal near-misses and near-misses related to blood transfusion (N-S1) 2. Provision of feedback via annual reports of the NBTS near-miss reporting system (N-S2) 3. non-punitive reporting systems (N-S3) 4. Voluntary reporting system at NBTS (N-S4) 5. Mandatory reporting system at FHB (N-S5) 6. User-friendly reporting system at NBTS (N-S6) 7. NBTS and FHB carrying out the administrative functions related to reporting (N-S7) | <p style="text-align: center;"><u>Weaknesses</u></p> <ol style="list-style-type: none"> 1. Unavailability of a system to report other near-misses in day-to-day clinical practice (N-W1) 2. Need to reveal the identity of the reporting officer (N-W2) 3. Less user-friendliness of the "Maternal near-misses Reporting Form" (N-W3) 4. Unavailability of a well-established mechanism to incorporate the preventive measures into the system as "best practices" (N-W4) |
| <p style="text-align: center;"><u>Opportunities</u></p> <ol style="list-style-type: none"> 1. Competent and well-trained health workforce (N-O1) 2. Availability of a designated directorate (DHQS) to provide technical guidance on patient safety and quality improvement programmes (N-O2) 3. Heads of the institutions are trained on patient safety and quality improvement in healthcare (N-O3) 4. Well-established QMUs in most hospitals (N-O4) 5. Availability of a designated MO/NO for the QMU (N-O5) | <p style="text-align: center;"><u>Threats</u></p> <ol style="list-style-type: none"> 1. Inadequate knowledge of most HCWs about near-misses and near-miss reporting (N-T1) 2. Negative perceptions among most HCWs about near-misses and reporting of near-misses (N-T2) 3. Influence from powerful trade unions in the health sector (N-T3) 4. Competing for other interests of some HCWs (e.g.: Consultants' perception that this is a performance evaluation and that it will affect the private practice) (N-T4) |
| <u>Adverse Event / Incident Reporting System</u> | |
| <p style="text-align: center;"><u>Strengths</u></p> <ol style="list-style-type: none"> 1. Already established adverse event/incident reporting systems supported by a guideline prepared by DHQS (A-S1) 2. Provision of feedback via annual reports (A-S2) 3. Non-punitive reporting system (A-S3) 4. Voluntary reporting system (A-S4) 5. User-friendly reporting system (A-S5) 6. Anonymous reporting system (A-S6) | <p style="text-align: center;"><u>Weaknesses</u></p> <ol style="list-style-type: none"> 1. Unavailability of a well-established mechanism to incorporate the preventive measures as "best practices" at the National level (A-W1) |
| <p style="text-align: center;"><u>Opportunities</u></p> <ol style="list-style-type: none"> 1. Competent and well-trained health workforce (A-O1) 2. Availability of a designated directorate (DHQS) to provide technical guidance for quality improvement programmes in the health sector (A-O2) 3. Heads of the institutions are trained on patient safety and quality improvement in healthcare (A-O3) 4. Well-established QMUs in most hospitals (A-O4) 5. Availability of designated MO/NO at QMUs (O5) | <p style="text-align: center;"><u>Threats</u></p> <ol style="list-style-type: none"> 1. Inadequate knowledge of some HCWs about adverse events/incident reporting (A-T1) 2. Negative perceptions among most HCWs about adverse events/incidents and reporting those (A-T2) 4. Competing for other interests of some HCWs (e.g.: Consultants in private practice) (A-T3) |

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POST-INTERVENTION PHASE

Separately designed KII and FGD guides were used to assess the effectiveness of the package of interventions. The designing and pre-testing of semi-structured guides followed the same process as the pre-intervention phase. During the post-intervention phase, feedback about the new reporting system was elicited from the head of the institution, consultants, SGNOs, sisters in charge, and in-charge nursing officers.

The data from consultative meetings, KIIs, and FGDs were recorded with the consent of participants and then transcribed. Thematic analysis was executed according to a pre-defined framework framed upon the KII and FGD guides. Coding was completed using a Thematic Analysis approach [10,11]. Analysis was led by the first author, with ongoing input from the broader research team. Quotes were captured and presented below to exemplify the main themes identified.

RESULTS

The results are provided separately for the pre-and post-intervention phases.

RESULTS OF THE PRE-INTERVENTIONAL PHASE

Thematic Analysis of Consultative Meetings

Several key issues were identified as the major bottlenecks in the current systems, including inadequate HCW knowledge about near-misses and adverse events/incidents; negative perceptions of HCWs about near-misses, adverse events/incidents, and reporting processes; poor user-friendliness of the existing near-miss reporting systems; and a lack of a well-established mechanism to incorporate preventive measures as best practices to be implemented across all healthcare institutions. The major gaps identified were that the existing near-miss reporting systems in Sri Lanka covered only maternal near-misses or those related to blood transfusions and that the current reporting forms were not user-friendly.

Thematic Analysis of KIIs and FGDs

Results of the KIIs held at the national and institutional levels during the pre-intervention phase are illustrated in Figure 2. The results of the FGDs of the pre-intervention phase are illustrated in Figure 3.

FIGURE 2 THEMATIC ANALYSIS OF KIIS (PRE INTERVENTIONAL PHASE)

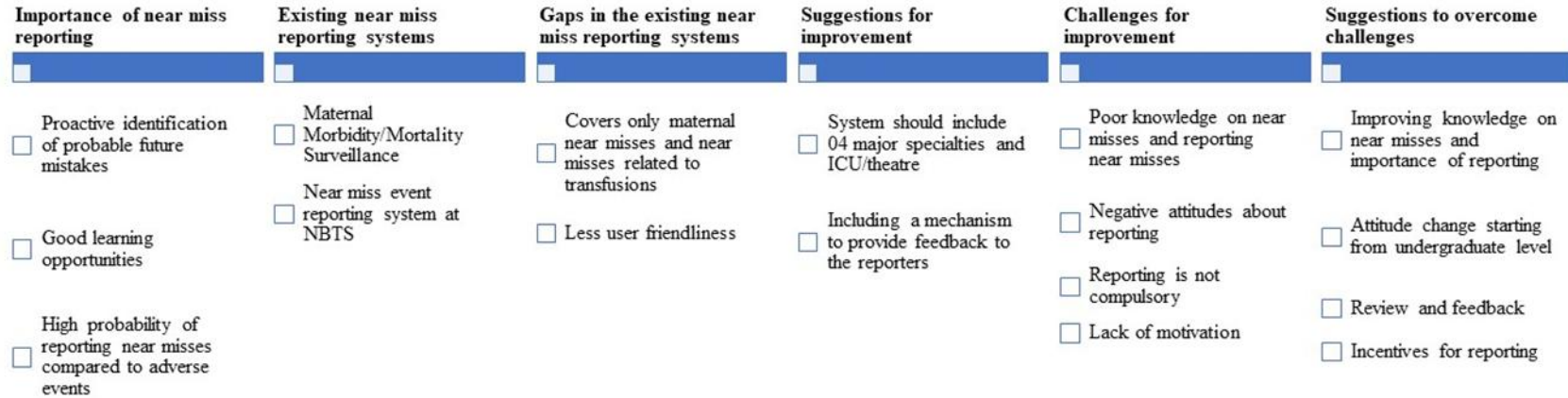


FIGURE 3 THEMATIC ANALYSIS OF FGDS (PRE INTERVENTIONAL PHASE)

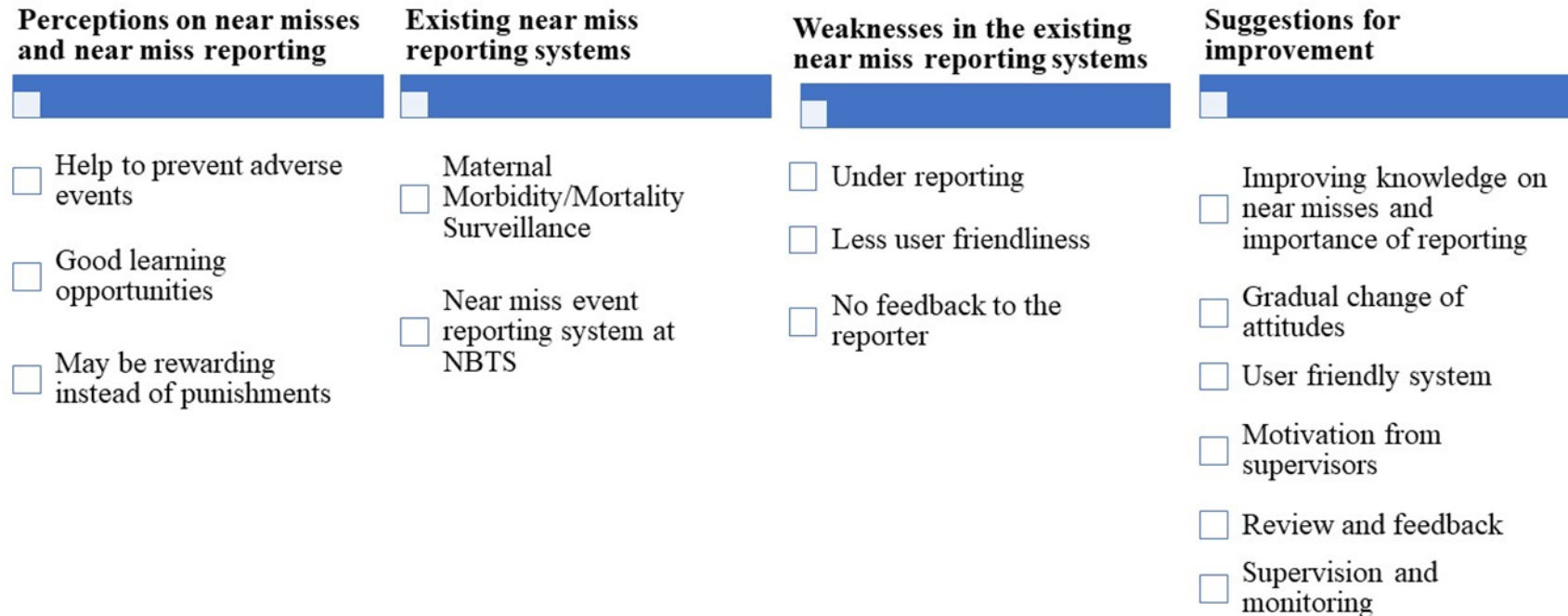


FIGURE 4 THEMATIC ANALYSIS OF KIIS (POST INTERVENTIONAL PHASE)

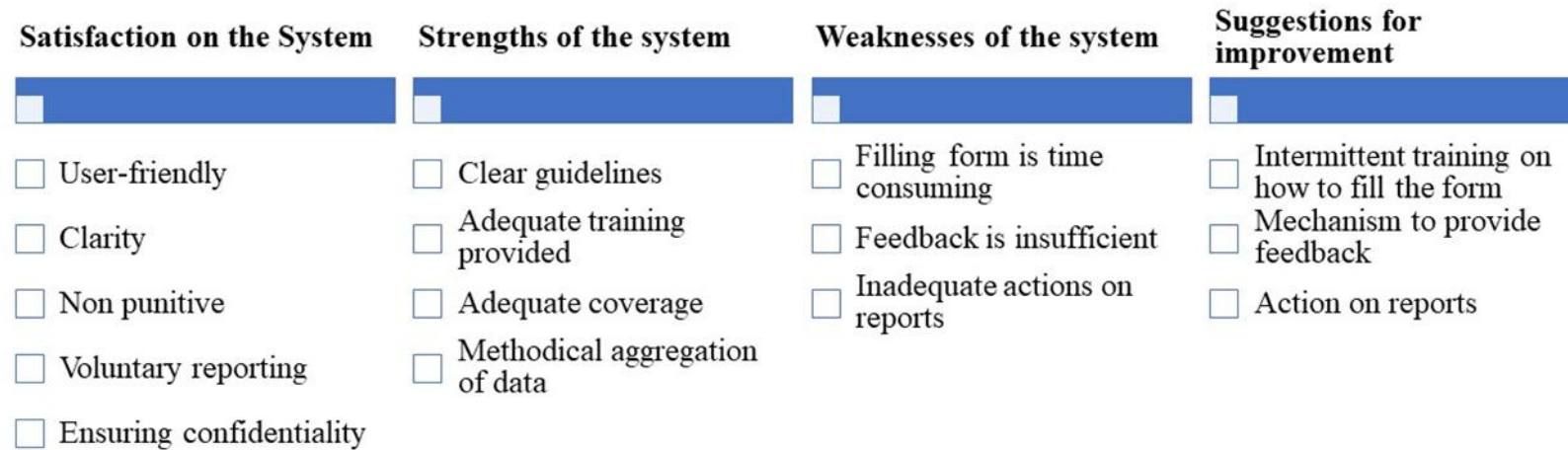
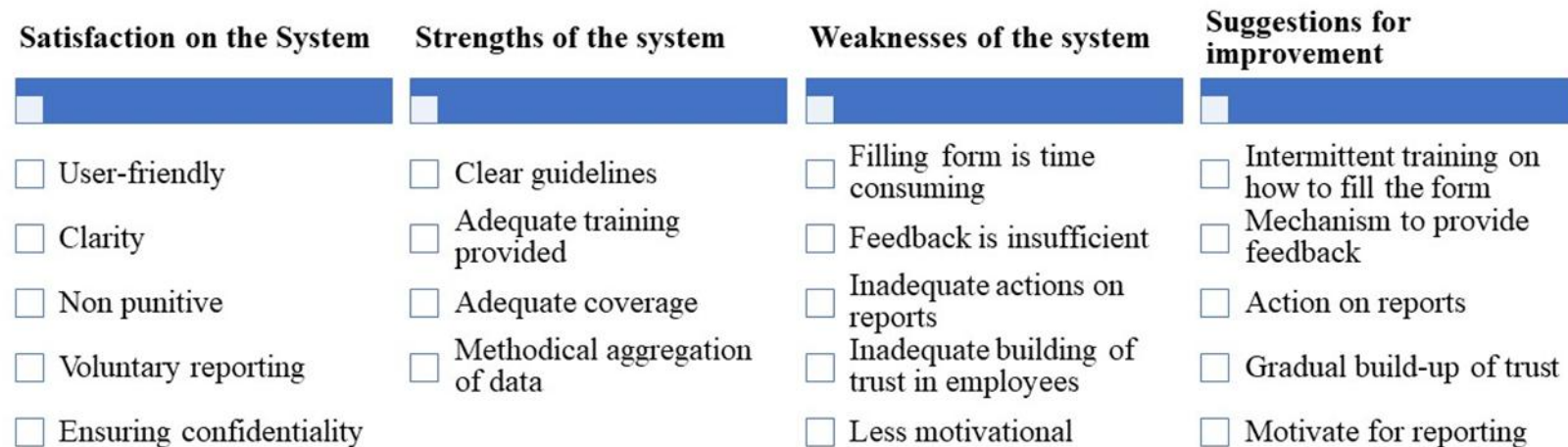


FIGURE 5 THEMATIC ANALYSIS OF FGDS (POST INTERVENTIONAL PHASE)



Reasons for under-reporting and strategies to improve reporting

Reasons for underreporting were highlighted at the initial national-level consultative meeting and the pre-interventional phase KIs and FGDs. Exemplifying quotes are presented below.

"Although we have a designated Directorate for Healthcare Quality and Safety, policies and guidelines, the HCWs' negative attitudes of HCWs contribute a lot to the reporting of near-misses. They think, "Why should we report?" and "Reporting will highlight our mistakes." If we want to improve reporting, we should include the importance of near-misses and reporting of those in the undergraduate and postgraduate curricular of HCWs,' and they should be given a good orientation about these at the time of recruitment." (DHQS- A)

"At [an] institutional level, lack of staff (designated medical officers for hospital QMUs), and frequent transfers of trained staff are significant barriers to reporting, because to maintain a successful reporting system, there should be a designated person who can monitor, analyse and provide feedback on the reports. In addition, HCWs' ignorance and negative attitudes are also barriers." (DGH Avissawella- B).

RESULTS OF THE POST -INTERVENTIONAL PHASE.

Results of the KIs and the FGDs during the post-interventional phase are illustrated in Figure 4 and Figure 5, respectively.

A total of eight near-misses were reported during the intervention period of three months. Three near-misses were radiology or laboratory-related, and two were related to the patient monitoring process of detecting circulatory problems on time and preventing patient harm. The details are depicted in Table 1. No adverse events/incidents were reported during the same three months.

TABLE 1: SUMMARY OF NEAR-MISSES REPORTED AT DGH AVISSAWELLA FROM 01.07.2022 TO 30.09.2022

| Category | Type | Category number | Frequency |
|----------------------------|---|-----------------|-----------|
| Drug administering process | Detecting a wrong dosage before administering/Detecting a wrong drug infusion rate set before administering | DA3 | 01 |
| Radiology/ Laboratory | Detecting delayed/missed important/critical radiological or laboratory investigation | RL3 | 03 |
| Patient monitoring process | Detecting circulatory problems on time and preventing patient harm | PM1 | 02 |
| | Detecting airway problems on time and preventing patient harm | PM2 | 01 |
| Other | A critical patient missed ECG monitoring for a brief period. | | 01 |
| Total | | | 08 |

The training programs held for medical officers and nursing officers might have helped to improve knowledge of near-misses and the importance of reporting near-misses, as well as alleviated negative perceptions. Nevertheless, during the post-interventional FGDs, the following views and suggestions were brought forward.

"The new near-miss reporting system has not won the trust of the employees yet. It does not motivate the employees to report near-misses. Therefore, we suggest holding intermittent training programs, establishing a mechanism to provide feedback, and gradually building trust among employees." (DGH Avissawella-C)

"We believe that once the employees get used to the system and understand the true value of reporting, the habit of reporting may be absorbed into the organizational culture." (DGH Avissawella-C)

DISCUSSION

The importance of national near-miss reporting systems is universally accepted. This pilot study provides an evidence-based foundation for implementing the first comprehensive national system in Sri Lanka.

Although this study was implemented at DGH Avissawella only, the intention is for it to be gradually expanded to other healthcare institutions to enable ongoing evaluations and refinement before national implementation. Both the initial pilot and intended future rollout have been assisted through multi-stakeholder support, including from the national focal point on patient safety and quality (DHQS).

The main interventions carried out in this study were identified through a scan of the international literature and a comprehensive analysis of existing process problems in Sri Lanka, including the need to design a user-friendly near-miss reporting form and guidelines. Since inadequate knowledge of near-misses and negative perceptions about reporting were identified as bottlenecks to implementing the key interventions, these were addressed through training programs. The initial pilot findings have emphasized that the new reporting system is user-friendly, non-punitive, voluntary, and confidential.

Feedback from system users was generally positive, but some users mentioned that filling out the form was time-consuming, feedback was insufficient, inadequate actions were taken on reports, the system was less motivational, and the trust of all employees had not yet fully gained. At the initial stage, considerable time may have been required to fill out the form as it was unfamiliar. Once HCWs become more used to filling out the forms during their routine work, the time required for reporting may be reduced, facilitating staff engagement and effective implementation.

Participants of national consultative meetings, KIs, and FGDs mentioned that the system should be voluntary to gain the employees' trust without resistance. Accordingly, the new Sri Lankan system is voluntary, in contrast to (for example) the Swedish and Danish systems [1]. In Finland's reporting system, the analysis and dissemination of results are only completed at the local hospital level [12]. In contrast, the proposed Sri Lankan system will undertake analysis and dissemination of results both at the national and local hospital levels. This approach is more similar to the system used in Japan, where, in addition to the national-level reporting system, healthcare providers use their own reporting and learning systems at the local hospital level [13].

The new Sri Lankan processes result in verbal feedback being provided during consultant and in-charge meetings. During the pilot, the discussion of two near-miss cases, including feedback and information about preventive measures taken, was conducted only with the staff involved, and other staff were unaware of the actions taken. In the reporting system of Switzerland (CIRNET), feedback is provided through Quick-Alerts, published in specialist journals and the Patient Safety Foundation website [12]. Furthermore, in a study in Western North Carolina, regular reminders and feedback were used to improve reporting [14]. In 2017, Japanese researchers identified that enhanced feedback for reporters promoted voluntary in-hospital reporting [4]. Aligning with best practice principles arising from this published research, the new Sri Lankan system involves a streamlined mechanism to provide feedback to healthcare professionals and use a periodic reminder system via social media groups to improve reporting.

Two studies from the United States have shown that the provision of incentives for staff for reporting led to more successful reporting at the initial stage of implementation [14,15], but the continuation of reporting in an established system was not dependent on incentives [15]. However, this approach has been criticized because these incentives may not be available in more resource-constrained settings [16]. In addition, it was postulated that incentives may lead to biases, create issues in the quality of reporting, and become impossible to remove without threatening the system's sustainability and viability [16]. For this reason, quality and safety stakeholders in other countries have developed successful near-miss reporting systems that are not dependent on the provision of monetary incentives to motivate behaviour change [17]. Due to the above reasons, the financial constraints present within the Sri Lankan health system, and the desire to create a sustainable, long-term system, our pilot study did not use financial incentives to facilitate implementation.

Under-reporting of near-misses was a major bottleneck identified in implementing a successful near-miss reporting system during this study, which is similar to experiences in other settings [18]. The literature suggests that providing training and education about near-misses and the importance of reporting near-misses, as well as ensuring the confidentiality of reporters and a blame-free culture, are important considerations in developing a near-miss system [19], and these principles informed the design and implementation of the new Sri Lankan system.

We found that HCWs' inadequate knowledge and negative perceptions had adversely affected the pre-existing level of reporting. For this reason, before implementing the new system, HCWs were given training on near-misses and the importance of reporting near-misses to reframe their perceptions more positively. However, it was found that more than training alone was needed to fundamentally improve the reporting behaviour of the participants. The project team postulates that once the habit of reporting is incorporated into organizational culture and when the new system has built trust among all employees, reporting behaviour is expected to improve over time. This illustrates the importance of viewing the development of the new system as just one element of the overall quality and safety agenda rather than as a standalone panacea capable of 'solving' all existing problems.

A more extended implementation period will be required for the new reporting system to produce the level of detailed near-miss data required to reach reliable conclusions about how similar or different Sri Lankan near-misses are to other countries. The project team is actively working towards this objective, using these pilot results as the foundation for this ongoing body of work.

LIMITATIONS

This reporting system was implemented in a single setting, and the findings cannot be generalized to other hospitals at this stage. The reporting was expected only from two categories of staff: medical officers and nursing officers. Therefore, at this stage of the implementation process, we cannot predict the level of compliance of other staff categories to the new reporting system. These limitations will be addressed through the broader trial of the reporting system in additional hospitals over the next year.

CONCLUSION

Although there are two current issue-specific near-miss reporting systems in curative healthcare institutions in Sri Lanka, there needs to be an inclusive near-miss reporting system covering all major specialties. The level of reporting of the existing systems is also unsatisfactory. This study provides a foundational evidentiary basis upon which the pilot can now be extended to other institutions, with the intention of the system being further refined before national implementation. This systematic, gradual approach will maximise the uptake and effectiveness of the new national system. A similar process is advocated for other countries in the region that do not currently have a near-miss reporting system. Quality and safety stakeholders from the region are encouraged to contact the project team to discuss opportunities for ongoing regional learning and collaboration.

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EVALUATION OF AN OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR CLINICAL DENTAL STAFF IN SRI LANKA

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ABSTRACT

OBJECTIVE:

Clinical Dental Staff (CDS) are vulnerable to Occupational Health and Safety (OHS) risks, particularly in resource-constrained Low and Middle-Income Countries (LMICs). There is limited contextually relevant research available to guide the stakeholders in LMICs to manage OHS risks. To strengthen the evidence base, a co-designed, multi-component OHS program for CDS was piloted at the Institute of Oral Health (IOH) in Sri Lanka.

DESIGN:

Mixed-method, pre-post study was conducted in three phases between June 2020 and July 2021. Phase I comprised a baseline assessment to identify OHS gaps, using a questionnaire, focus groups, interviews and observational checklists, involving Dental Surgeons (n=46), Nursing Officers (n=16) and Health Care Assistants (n=78). Phase II involved the development and implementation of targeted interventions, which were developed with the consensus of project participants. Phase III evaluated post-implementation impact after three months.

SETTING:

Institute of Oral Health (IOH), Sri Lanka

MAIN OUTCOME MEASURES:

Knowledge, attitudes, practices and satisfaction of CDS and occurrence of OHS events and complaints.

RESULTS:

Initial assessment revealed several challenges, including a lack of OHS-related staff awareness and training, inadequate reporting mechanisms and insufficient institutional guidelines. The interventions implemented included: OHS guideline creation, OHS training programs, knowledge sharing workshops, the establishment of an OHS management focal point, introduction of reporting mechanisms, welfare facility improvements, staff Hepatitis B vaccination and psychosocial support programs. The Phase III findings demonstrated significant improvements in staff knowledge, attitudes, practices and satisfaction with selected OHS measures. However, CDS satisfaction with welfare facilities and psychosocial support did not significantly improve.

CONCLUSIONS:

This study revealed that focused and co-designed OHS interventions effectively enhance the knowledge, attitudes, practices and satisfaction of CDS. CDS reported post-implementation reduction in OHS incidents and complaints. The study highlighted the importance of stakeholder engagement and the use of co-designed multiple interventions in improving OHS in resource-constrained settings.

KEYWORDS

occupational health, occupational safety, hospital dental staff, sri lanka, mixed-methods, pre-post implementation study

INTRODUCTION

Occupational Health and Safety (OHS) is the science of anticipating, recognising, evaluating and controlling workplace hazards that could impair health and well-being [1]. Occupational threats include long-term and short-term risks that can lead to chronic and acute health outcomes [2]. Chronic conditions may cause permanent physical impairments [3], while acute health outcomes result in immediate injury, infection or toxic exposure, leading to productivity losses and medical costs [4, 5].

Globally, workplace accidents and illnesses affect employee health, with over 340 million incidents reported annually [6]. Despite prevention measures, approximately 4% of the world's annual gross domestic product is lost due to OHS risks [6]. In the United States, employers spend USD 170 billion annually on occupational injuries, illnesses and managing health outcomes [7]. These incidents contribute to staff turnover, absenteeism, migration and early retirements [8]. A systematic review by Robson et al. (2007) reported that only 13 studies assessed OHS management system effectiveness. Despite methodological limitations, all studies reported positive outcomes from OHS interventions.

Poor OHS reporting and weak surveillance hinder hazard identification, management, and risk in the healthcare industry [9]. Underreporting remains a major barrier to reducing OHS risks [10]. A Canadian study found that developing databases, adapting risk assessments and implementing interventions improved OHS outcomes and were cost beneficial. Evidence indicates that negative OHS outcomes are mostly preventable through maintenance systems, timely reporting and regular monitoring [11]. This is particularly true in Low- and Middle-Income Countries (LMICs), where OHS is often neglected in healthcare workforce training and organisational practice [12, 13].

OHS RISKS ASSOCIATED WITH CLINICAL DENTAL STAFF

Clinical Dental Staff (CDS) face different occupational risks, including physical (radiation, pressure systems), chemical (mercury, anaesthetic gases, latex), biological, psychological, ergonomic and mechanical risks [14, 15]. Needle stick injuries are frequently reported and stress is a significant hazard, with dentistry perceived as highly stressful [14]. Musculoskeletal issues, especially backache are common in dentistry.

SRI LANKAN HEALTHCARE CONTEXT

Sri Lanka faces challenges in OHS provision, such as no national standardised OHS system, leading to inconsistent practices [16], inadequate screening, insufficient staffing and lack of surveillance systems [17]. Poor reporting mechanisms likely underestimate OHS incidents. Most CDS do not attend OHS awareness sessions despite being exposed to hazards [18, 19], further increasing their risk of injury.

Adverse OHS outcomes among dental staff are high in LMICs, including Sri Lanka due to limited preventative measures [20]. Although improvements have been recommended, research remains limited [21]. This project aimed to implement and evaluate integrated OHS measures for CDS in the Institute of Oral Health (IOH), Sri Lanka, a premier, specialised dental hospital.

METHODS

This pre-post pilot study was conducted in three phases (June 2020 to July 2021). Phase I involved an initial baseline assessment of OHS measures using a questionnaire, focus groups, interviews (semi-structured) and an observational checklist. Phase II developed and implemented interventions targeting OHS gaps identified in Phase I. Phase III, conducted three months after the conclusion of Phase II, re-administered the Phase I tools to evaluate outcomes. The study setting was the IOH, as it is a leading dental hospital in Sri Lanka serving Colombo and the nearby regions.

Ethical approval was obtained from the Ethics Review Committee of the Post Graduate Institute of Medicine, Sri Lanka (ERC/PGIM/2020/136). Administrative permission was granted by the Ministry of Health and the unit heads of the IOH.

PHASE I – BASELINE ASSESSMENT

Baseline OHS processes were assessed by including all staff categories, through a questionnaire, focus groups, interviews and an observational checklist. The study instruments were developed using international and domestic literature [11, 19, 22, 23], reviewed by OHS experts, validated for face and content and piloted at a separate hospital before revision [24]. Focus group discussions with Dental Surgeons (DSs), Nursing Officers (NOs) and Health Care Assistants (HCAs) explored experiences and perceptions of OHS. Sessions (around 90 minutes) continued until thematic saturation [25]. Interviews (40-60 minutes) were conducted with senior staff, including the deputy director, consultants and unit heads, to explore deficiencies and suggestions for improvement. The observational checklist assessed welfare facilities (toilets, rest areas, PPE), vaccination coverage and adherence to OHS guidelines.

All focus group and interview transcripts were thematically coded and analysed (25). Questionnaire Likert responses were dichotomised into 'satisfactory' or 'unsatisfactory.' Composite scores were created for knowledge, attitudes, practices and satisfaction. Quantitative analysis (SPSS v22) generated descriptive statistics. McNemar's test was used to assess pre- and post-change differences.

PHASE II – INTERVENTION DEVELOPMENT AND IMPLEMENTATION

Phase I findings were collated and presented to all project stakeholders at consultative meetings at IOH. A strengths, weaknesses, opportunities and threats (SWOT) analysis approach was used to identify gaps in existing OHS processes at IOH and to set target priorities [26]. Strategies were developed with the TOWS matrix [26], considering feasibility and acceptability. Consensus among stakeholders finalised the OHS interventions, which were then implemented at IOH.

PHASE III – FOLLOW-UP EVALUATION

Three months post-implementation, the similar assessment tools were re-administered to the same staff groups to evaluate changes in OHS practices.

RESULTS

PHASE I – BASELINE ASSESSMENT

The questionnaire responses were collected from 140 participants, including 46 DSs (32.9%), 16 NOs (11.4%) and 78 HCAs (55.7%). The mean age was 37.04 years, and the majority (N=99; 70.7%) were female. The mean service period of participants was 11.05 years. Six focus group sessions were completed with 56 personnel, comprising 22 DSs, six NOs and 28 HCAs. Interviews were conducted among 11 staff members, including the deputy director of the IOH, the medical officer planning, five consultants, three DSs and an in-charge NO. The observational checklist was systematically completed across all areas, encompassing the four clinical units (outpatients department, orthodontic, restorative and community dental unit), as well as ancillary spaces.

PHASE II – INTERVENTION DEVELOPMENT AND IMPLEMENTATION

Targeted OHS strategies were developed through consultative and SWOT analysis meetings at the IOH and engagement with IOH stakeholders, including CDS (3 consultants, 10 DSs, two NOs, 16 HCAs) and five administrative staff members. To

provide additional clarity on the intervention development process, consensus was reached through a combination of methods, including brainstorming potential interventions, prioritising options based on feasibility and impact and voting on the most promising strategies. The stakeholder group agreed on the final selected interventions, which included the development of OHS guidelines, knowledge and awareness workshops, appointing an OHS focal point within the institution, improving staff Hepatitis B vaccination rates and improving welfare facilities and psychosocial support services for staff. Each of these elements is briefly summarised below.

Development of OHS guidelines:

New guidelines were developed to outline the workplace safety procedures. They included the following key components: best practice OHS for dental care, hazard identification and risk assessment, incident reporting and investigation, and training and awareness. The guidelines were made available in paper and electronic form and disseminated through various channels, including staff meetings, training sessions and management committee meetings, then stored for further reference in the online staff resource and in a paper version in all staff department facilities.

Knowledge and awareness workshops:

Staff education and training were conducted to promote awareness and understanding of OHS and the new guidelines among CDS in IOH. Four in-person sessions, each lasting four hours, were conducted across four weeks. The sessions were delivered interactively to engage staff in identifying hazards or risks and developing solutions.

Establishment of an OHS focal point officer:

- A. An IOH staff member was appointed as a dedicated OHS officer aimed at streamlining reporting mechanisms. The purpose was to enhance the effective implementation of the OHS guidelines by actively engaging with staff and systematically gathering information for informed, proactive decision-making. This included conducting comprehensive hazard assessments and investigating incidents.

Improving Hepatitis B vaccination:

A staff vaccination campaign was implemented to improve the Hepatitis B vaccination coverage. This involved establishing mechanisms to identify non-vaccinated employees and prompting referral, establishing mechanisms to check the Hepatitis B antibody levels and ensuring the vaccination supply chain.

Improved welfare activities:

Collaborative efforts were exerted to enhance the quality of drinking water facilities and food in the staff canteen, upgrade the quality of rest and changing rooms and ensure availability of personal protective equipment.

Improving psychological support:

Confidential counselling and support services were made available to staff members experiencing work-related stress or other psychosocial issues. These services were complemented by four support awareness sessions conducted in parallel with the OHS education awareness programme.

QUALITATIVE RESULTS

Phase I: Pre-interventional assessment

Thematic analysis of focus group and interview data uncovered several OHS challenges within IOH. These included staff reporting the absence of specific OHS training for most CDS, a lack of established reporting mechanisms and the absence of institutional guidelines or written documents in the workplace. Additionally, respondents reported that slow progress in upgrading dental equipment, infrastructure and welfare facilities further exacerbated these challenges. Analysis of open-ended questions highlighted that staff felt there was an increasing workload across all staff categories, contributing to occupational stress. The findings also highlighted the need to improve the Hepatitis B vaccination status and enhance the psychosocial support available to staff.

Phase III: Post-interventional assessment

Based on the findings of focus groups, it became evident that the knowledge and awareness sessions were beneficial for CDS. The established focal point officer and reporting mechanism led by the medical officer – planning successfully

promoted effective coordination and communication among various units within the IOH. The focal point officer served as the central point of contact, ensuring that all units worked cohesively and collaboratively and that information flowed throughout the IOH. The reporting mechanism facilitated regular updates from each unit, allowing for timely additional support where necessary. The analysis of interview data revealed that staff reported a substantial improvement in OHS and fewer workplace injury complaints after implementing the multi-component project. Participants expressed satisfaction with the implemented measures. Overall, the qualitative data collected through focus groups and interviews during the evaluation phase suggested that the strategies implemented had been effective at improving OHS within the IOH and the well-being of CDS.

QUANTITATIVE RESULTS

Participants' knowledge

There was a significant improvement in the knowledge of participants ($p < 0.05$) following the implementation of interventions (Table 1). There was a decrease in the number of participants who reported having 'unsatisfactory OHS knowledge' and an increase in those reporting 'satisfactory OHS knowledge' in all three categories: knowledge of occupational hazards, knowledge of the prevention of adverse health outcomes and knowledge of protective measures.

TABLE 1: PARTICIPANTS' KNOWLEDGE OF OHS

| | Pre-intervention | | Post-intervention | | p-value McNemar's test |
|--|------------------|------|-------------------|------|---------------------------|
| | N=140 | | N=140 | | |
| | N | % | N | % | |
| Knowledge of occupational hazards in clinical dentistry | | | | | |
| Satisfactory | 69 | 49.3 | 93 | 66.4 | p=0.002 |
| Unsatisfactory | 71 | 50.7 | 47 | 33.6 | |
| Knowledge of the prevention of adverse health outcomes due to occupational hazards in clinical dentistry | | | | | |
| Satisfactory | 47 | 33.6 | 103 | 73.6 | p=0.000 |
| Unsatisfactory | 93 | 66.4 | 37 | 26.4 | |
| Knowledge of the protective measures related to OHS among staff | | | | | |
| Satisfactory | 31 | 22.1 | 77 | 55.0 | p=0.000 |
| Unsatisfactory | 109 | 77.9 | 63 | 45.0 | |

Participants' attitudes

Participants' attitudes were evaluated in three domains: occupational hazards, preventing adverse outcomes and protective measures, which illustrated a significant improvement ($p < 0.05$) (Table 2).

TABLE 2: PARTICIPANTS' ATTITUDES ON OHS

| | Pre-intervention | | Post-intervention | | p-value McNemar's test |
|--|------------------|------|-------------------|------|---------------------------|
| | N=140 | | N=140 | | |
| | N | % | N | % | |
| Attitudes on occupational hazards | | | | | |
| Satisfactory | 79 | 56.4 | 95 | 67.9 | p=0.002 |
| Unsatisfactory | 61 | 43.6 | 45 | 32.1 | |
| Attitudes on the prevention of adverse health outcomes | | | | | |
| Satisfactory | 66 | 47.1 | 83 | 59.3 | p=0.040 |
| Unsatisfactory | 74 | 52.9 | 57 | 40.7 | |
| Attitudes on the protective measures | | | | | |
| Satisfactory | 63 | 45.0 | 90 | 64.3 | p=0.001 |
| Unsatisfactory | 77 | 55.0 | 50 | 35.7 | |

Participants' practices

There was also a significant ($p < 0.05$) improvement in staff practices in relation to OHS measures and the reporting of OHS hazards to hospital management (Table 3). However, there was no significant improvement ($p > 0.05$) in practices related to managing occupational psychological risks despite an increase in participants reporting satisfactory practices.

TABLE 3: PARTICIPANTS' PRACTICES RELATED TO OHS

| | Pre-intervention | | Post-intervention | | p-value McNemar's test |
|--|------------------|------|-------------------|------|---------------------------|
| | N=140 | | N=140 | | |
| | N | % | N | % | |
| Practice of control measures | | | | | |
| Satisfactory | 57 | 40.7 | 82 | 58.6 | p=0.007 |
| Unsatisfactory | 83 | 59.3 | 58 | 41.4 | |
| Reporting of OHS hazards to hospital management | | | | | |
| Satisfactory | 69 | 49.3 | 93 | 66.4 | p=0.002 |
| Unsatisfactory | 71 | 50.7 | 47 | 33.6 | |
| Management of occupational psychological risks | | | | | |
| Satisfactory | 64 | 45.7 | 73 | 52.1 | P=0.150 |
| Unsatisfactory | 76 | 54.3 | 67 | 47.9 | |

Participants' satisfaction

The most noticeable improvement was staff satisfaction with the level of adherence to guidelines, satisfaction with reporting mechanisms, awareness of OHS and vaccination status (Table 4 and Figure 1). However, the improvement in satisfaction regarding welfare facilities and strengthened psychosocial support did not show a significant statistical difference ($p > 0.05$, Table 4).

FIGURE 1: RADAR CHART COMPARING PRE- AND POST- CHANGES IN STAFF SATISFACTION LEVELS ASSOCIATED WITH IMPLEMENTED INTERVENTIONS

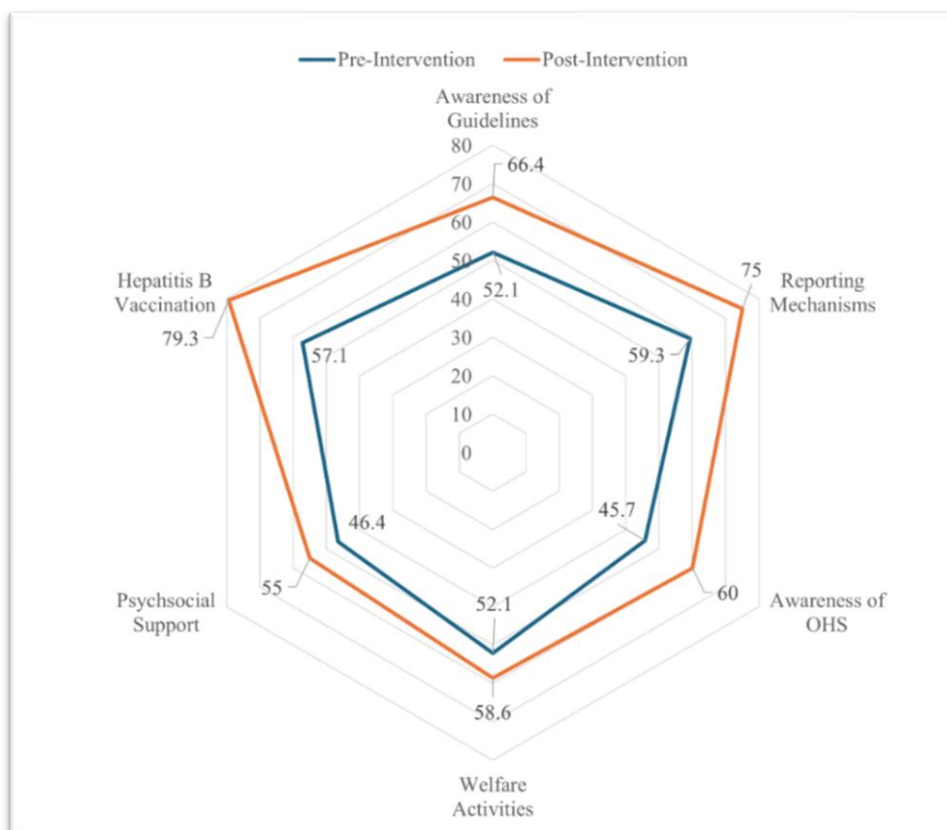


TABLE 4: PARTICIPANTS' SATISFACTION WITH OHS MEASURES

| | Pre-intervention | | Post-intervention | | p-value McNemar's test |
|---|------------------|------|-------------------|------|---------------------------|
| | N=140 | | N=140 | | |
| | N | % | N | % | |
| Adherence to OHS guidelines | | | | | |
| Satisfactory | 73 | 52.1 | 93 | 66.4 | p=0.019 |
| Unsatisfactory | 67 | 47.9 | 47 | 33.6 | |
| Reporting mechanism for OHS | | | | | |
| Satisfactory | 83 | 59.3 | 105 | 75.0 | p=0.007 |
| Unsatisfactory | 57 | 40.7 | 35 | 25.0 | |
| Awareness of OHS | | | | | |
| Satisfactory | 64 | 45.7 | 84 | 60.0 | p=0.002 |
| Unsatisfactory | 76 | 54.3 | 56 | 40.0 | |
| Welfare facilities in IOH | | | | | |
| Satisfactory | 73 | 52.1 | 82 | 58.6 | p=0.163 |
| Unsatisfactory | 67 | 47.9 | 58 | 41.4 | |
| Strengthening of psychosocial support in IOH | | | | | |
| Satisfactory | 65 | 46.4 | 77 | 55.0 | p=0.088 |
| Unsatisfactory | 75 | 53.6 | 63 | 45.0 | |
| Hepatitis B vaccination at IOH | | | | | |
| Satisfactory | 80 | 57.1 | 111 | 79.3 | p=0.000 |
| Unsatisfactory | 60 | 42.9 | 29 | 20.9 | |

Welfare facilities, Hepatitis B vaccination and status of OHS guidelines

As indicated in Table 5, improvement in Hepatitis B vaccination and OHS guideline compliance increased from 60% to 80% and 25% to 100%, respectively. Hepatitis B vaccination rate resulted in a significant improvement ($p=0.000$) in satisfaction. However, the availability of welfare facilities only improved from 58% to 67%, which was not statistically significant.

TABLE 5: AVAILABILITY OF WELFARE FACILITIES, HEPATITIS B VACCINATION AND STATUS OF OHS GUIDELINES

| Criteria | Pre-interventional percentage | Post-interventional percentage |
|----------------------------|-------------------------------|--------------------------------|
| Welfare facilities | 58.34% | 66.7% |
| Hepatitis B vaccination | 60% | 80% |
| Adherence to OHS guideline | 25% | 100% |

DISCUSSION

There is limited published research available to guide the design and implementation of effective OHS risk management interventions in LMIC clinical dental settings [21]. This mixed-methods study strengthened the evidence base by evaluating a holistic package of co-design OHS measures in the leading Sri Lankan specialist dental hospital. The key findings were that staff OHS knowledge, attitudes, practices and satisfaction significantly improved without any significant association to the age or service period, as a result of targeted, mutually supportive OHS interventions implemented with CDS. The implemented intervention package included the development of and adherence to new guidelines on OHS, knowledge and awareness sessions, streamlined reporting mechanisms and increasing Hepatitis B vaccination coverage. As a result of these strategies, staff reported that fewer OHS complaints and injuries occurred at the IOH following the implementation. A discussion of each of the key findings of this study are presented below to situate them within the context of relevant international literature and clarify their implications for research, policy and practice.

OHS GUIDELINES:

OHS guidelines are crucial for systematically identifying and mitigating dentistry-related occupational hazards [19]. By developing a guideline based on current necessities, safe practice for CDS is more effective, resulting better patient outcomes, improved cost-effectiveness and the ability of authorities to identify the priority areas and research gaps [27, 28]. Kwak and colleagues [29] emphasise the importance of considering end-users in guideline development to achieve effective implementation and institutionalisation. Stakeholder participation in the change process in this study significantly contributed to the development of effective guidelines, which led to an increase adherence and optimised protective and preventive OHS measures among CDS. Regular training, continuous stakeholder involvement and periodic updates of guidelines are essential to ensure sustained compliance, especially in clinical settings with high personnel turnover [30]. The guideline highlighted important areas and priorities, as identified by staff and resulted in significant satisfaction among participants. The implications of these findings extend to policy by reinforcing the need for regulatory bodies to support continuous updates to OHS guidelines. In clinical practice, fostering an environment of ongoing education and stakeholder engagement can improve long-term adherence [31, 32]. For research, these findings underline the importance of investigating the impact of evolving clinical settings on guideline compliance and exploring strategies for overcoming barriers to sustained implementation.

KNOWLEDGE AND AWARENESS TRAINING:

The study reported that employee training is important for minimising adverse health outcomes of occupational hazards, similar to other studies [33]. The need for awareness sessions was identified as a key requirement for CDS, as almost 90% of staff reported that they did not receive any OHS training. This was in contrast to Nigerian dental staff, where all CDS were aware of occupational exposure to hazards and the majority had attended on-the-job trainings [34]. Despite initially low awareness levels, the training sessions led to substantial improvements across all measured parameters, demonstrating that targeted education can make a significant impact among CDS.

OHS FOCAL POINT OFFICER:

Introduction of a dedicated OHS officer and a formal reporting mechanism for OHS is an essential component in promoting evidence-based decision-making, which significantly improved the participants' satisfaction with reporting mechanisms. Strengthening occupational injury and surveillance systems is a timely requirement, as outlined in the occupational safety and health policies [17]. Importantly, institutional focal points may reduce the underreporting of occupational hazards, a challenge commonly observed in developing or resource-constrained settings.

STAFF PSYCHOLOGICAL SUPPORT:

Lee and colleagues [35] found that CDS commonly experience work-related stress and occupational burnout. In this study, CDS at the IOH reported experiencing higher stress in their duties. Despite the implementation of awareness sessions aimed at promoting stress management at both individual and institutional levels, significant improvement remained elusive. A study conducted in India also identified occupational-related stress as a key concern among the CDS [15], indicating that this issue is widespread. The participants in this study did not report a significant increase in their satisfaction with the psychosocial support provided by IOH. One possible reason may be the project team's limited scope and poor administrative authority, which prevented more intensive interventions.

The integration of mixed methods in this project strengthens the evaluation process and facilitated the design and delivery of an evidence-based, multi-component intervention [36]. Before implementing strategies, a detailed assessment of existing OHS processes was conducted using a range of methods. The findings were critically examined in the context of international and domestic literature [21]. Importantly, these findings underscored the effectiveness of a multi-method approach in both implementing and evaluating interventions, as it enables a deeper understanding of complex issues and supports the development of more targeted and impactful solutions.

To achieve improvement in OHS, it is crucial to engage stakeholders in developing and implementing OHS programmes [37]. Stakeholder engagement and co-design strategies have been identified as successful approaches for driving healthcare improvement [38]. When CDS and other relevant stakeholders participate in the development and

implementation process, OHS programmes can be tailored to specific contexts and the needs of end-users. In this project, stakeholder participation was instrumental in prioritising interventions and achieving measurable improvements. SWOT analysis and the TOWS matrix were effectively used to guide the development of context-specific OHS interventions [39]. These approaches provided practical guidance, strengthened institutional capacity and enhanced the delivery of OHS training. Embracing a scientific approach that considers administrative feasibility, acceptability and time availability is crucial for the successful advancement of healthcare initiatives [10].

STUDY LIMITATIONS

The generalisability of the findings was limited by only having one research site. However, as the leading specialist dental hospital in Sri Lanka, the findings are likely to be relevant for informing practice at comparable facilities across the country and in other LMICs. The short interval between pre- and post-assessments may have hindered a comprehensive assessment of the research project's sustainability and/or impact. Additionally, the involvement of an external team in the intervention introduces potential challenges to its sustainability despite the significant outcomes achieved. Ensuring the continuity of these improvements is essential for maintaining occupational safety within the dental workforce. The authors are working with policy and industry collaborators to examine the feasibility of conducting further research to evaluate whether the findings were sustained. As for most global research conducted during the study period, disruptions resulting from the COVID-19 pandemic in Sri Lanka also affected the implementation of certain activities, such as follow-up evaluations and post-intervention data collection.

CONCLUSIONS

The results indicate that the package of interventions designed and implemented within this project significantly improved clinical staff's knowledge, practices and satisfaction with OHS measures, with a reduction in OHS incidents reported by staff post-implementation. The study demonstrated that integrating multiple interventions can effectively enhance OHS outcomes, despite being conducted at a single centre. This Sri Lankan intervention highlights the importance of stakeholder engagement and co-design as crucial within health service innovation and offers valuable insights for improving OHS in similar healthcare settings, particularly in LMICs. Future research should examine the long-term impacts of the project and the extent to which the co-design approach used can produce similarly positive outcomes in other facilities across Sri Lanka and specialist dental hospitals in other LMICs.

AUTHORSHIP

CJ contributed to the initial conceptualisation and design of the study. IS supervised the project and was actively involved in conceptualisation throughout all stages. CJ, IS and DD contributed to data analysis and interpretation. CJ drafted the initial manuscript. IS, RH, DD, CM and AR critically reviewed and revised the manuscript for important intellectual content. All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work, ensuring its accuracy and integrity.

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