

UNDERSTANDING PATIENT FLOW FROM THE PERSPECTIVES OF PATIENT MOVEMENT EXPERTS

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ABSTRACT

BACKGROUND:

Poor patient flow or patient movement through a healthcare organisation can lead to adverse outcomes for patients and organisational inefficiency. Many hospitals have addressed suboptimal patient flow by increasing resources, such as bed stock and staffing; however, this is an unsustainable approach. In determining the nature of poor patient flow issues, it is important to collect data from healthcare professionals who manage patient flow daily. Doing so provides insights into the current state of patient flow management in its entirety, whilst also helping with the development of sustainable solutions.

METHODS:

Thirteen semi-structured interviews were conducted with healthcare professionals who were directly involved with patient flow at a referring hospital in Tasmania, Australia.

RESULTS:

Using a thematic analysis method, four major themes were developed. The first major theme was: 'managing patient flow' which centered around known and unknown demands on bed availability. The second theme, 'communication for decisions', highlighted the essential role of communication in maintaining patient flow. The third theme, 'tools as enablers and barriers, relates to the number of software programs which can both help and hinder patient flow. The final theme of 'increasing complexity' is related to an apparent trend towards greater numbers of patients requiring care of an increasingly specialised nature.

CONCLUSIONS:

The findings of this study provide great insights into patient flow issues, with potential solutions identified to address them.

KEYWORDS

Patient flow, Lean, Communication, Complexity, Tools

INTRODUCTION

Patient flow can be defined as the movement of patients through the entire healthcare facility [1] encompassing arrivals, admissions, and discharges. In an ideal state, a hospital's capacity is perfectly matched to its demand, allowing patients to flow through the system seamlessly [2]. Suboptimal patient flow, on the other hand, can lead to adverse outcomes for patients and organisational inefficiency. It contributes to Emergency Department (ED) crowding, bed access block, and increased length of stay (LOS), all of which pose substantial risks to patient safety [3,4]. Indeed, the risk of inpatient mortality for patients admitted via the ED during crowded periods can be as much as 34% higher compared to those admitted during non-crowded periods [5]. The impact of poor patient flow is also felt throughout hospitals more broadly, in the form of a decreased quality of care for admitted patients [6] and reduced financial performance [7], among other factors.

Benjamin and Jacelon distinguish between patient flow and patient flow *management*, defining the latter as “the application of holistic perspectives, dynamic data, and complex considerations of multiple priorities to enable timely, efficient, and high-quality patient care” (p.429) [8]. In practice, this often means managing patient admissions from EDs, operating theatres and outpatient clinics [9], and doing so while factoring in the unique needs of patients and the characteristics of available bed stock [8]. Notwithstanding their central role in a hospital's functioning, until recently relatively little was known about the roles of clinicians charged with maintaining patient flow and the factors driving their decision-making [10]. The extant literature on this topic is predominantly focused on the roles of specialist nursing staff designated as Patient Flow Managers (PFMs) [10]. Given that flow management requires the cooperation of multiple professions in several intertwined activities and interactions [11], there is impetus to learn more about the contribution of other clinicians (e.g., ED doctors, surgeons) towards patient flow.

Despite the numerous professions and a myriad of factors involved in patient flow management, a 2018 systematic review noted that, historically, most solutions aimed at improving patient flow did so by simply increasing resourcing (e.g., bed stock, staffing), an approach which is wholly unsustainable [12]. This review and another [13] cautioned against addressing patient flow in this way, instead emphasising the need to work with clinicians whose

roles involve managing patient flow to devise strategies that are both cost-effective and feasible. One approach towards improving patient flow that has been applied with moderate success is the use of ‘Lean’ principles, which examine processes and seek to identify areas of waste [14]. Lean identifies eight types of waste:

- defects – spending time on doing something incorrectly;
- overproduction – doing more than what is required;
- transportation – unnecessary moving of patients through a hospital;
- waiting – for procedures; inventory – excess stock;
- motion – employees move more than necessary;
- overprocessing – work not valued by health consumers;
- human potential – healthcare professionals are not engaged, heard or supported [15].

The utilisation of Lean thinking in healthcare is an increasingly popular strategy for improvement of service efficiency, with many patient flow studies focusing on increasing patient throughput [16,17] and bed block issues [18,19]. Nicosia et al. investigated the use of Lean as a patient flow improvement tool from the nursing staff perspective and suggests that, although Lean is effective, more research is needed to understand how to reduce competing demands and time stress for nurses [20]. Moreover, a variety of decision-making tools have been developed for service planners using Lean principles. One of these tools is a system dynamics decision support tool for older people. The tool or model represents patient flow through the ED starting from a call for help through to ED presentation, admission, and discharge [21]. In many EDs, voices have been raised expressing the need for formal and accurate tools assisting hospital and patient flow managers with decision making processes to ensure high quality person-centered care [22]. Data mining and the use of machine learning to predict ED admissions coupled with algorithms to develop predictive models, has been put forward as a potential solution to assist with patient flow [23]. The setting for this study was a medium-sized referring hospital in Tasmania, Australia, which has been impacted by patient flow issues. This hospital provides care for up to 250,000 residents, including acute, sub-acute, mental health, aged care, and ambulatory services. The hospital's ED sees 60,000 presentations a year. In 2019, the accumulation of issues led to 93% access block and

ramping of 13.5% of ED presentations. Unfortunately, the issues resulted in several near misses, putting patients at risk. The hospital ED presentations are increasing year by year 34.3% since 2009-2010. Furthermore, ED waiting times were consistently below the 4-hour target between 2009 and 2018, and the rate of adverse events per 1,000 ED presentations also doubled during the period 2015-2018. In 2019, software technologies were put in place to deal with some of the issues. However, this intervention only has been partly successful. The aim for this study is therefore to gain insights and a deeper understanding about factors that influence patient flow and use them to build models for optimising patient flow. Doing so will not only provide further insight into the current state of patient flow management in its entirety but will also identify wasteful processes to be targeted in future lean interventions helping to reduce length of stay, and improve quality of care, organisational efficiency and effectiveness.

MATERIALS AND METHODS

A pragmatic qualitative approach was employed, conducting in-depth consultations with 13 clinicians and managers at a referring hospital in Tasmania, Australia. Purposive sampling took place, identifying participants who were involved with the patient flow under investigation. The number of participants were not known at the start of the study, as this was determined by reaching data sufficiency [24]. The method of purposive sampling was employed to increase the depth of understanding and to select participants that have in-depth knowledge about patient flow. To ensure that the right participants were identified, one of the researchers (who is also a clinician employed by the same hospital) provided a list of potential candidates. Sixteen participants were contacted and 13 agreed to be interviewed. Interviewees were clinicians from a variety of discipline backgrounds - nursing, allied health, and medicine - who held the positions of Patient Flow Manager, Clinical Nurse Consultant, Nursing Director, Emergency Medicine Physician, and Hospital Director.

Staff were sent an email inviting them to participate in the study. This email contained a brief overview of the study, information about participation, and a consent form. Consent was obtained from participants by having them sign and return a copy of this form, either via email or in person. If, after a period of two weeks, there was no reply received to the initial email, the researchers sent one follow up email as a final attempt to recruit the staff member.

DATA COLLECTION

Participants were asked to nominate a suitable time and location to be interviewed. All interviews were held in person, with the majority being conducted in the participants' place of work, and the remainder inside offices in the University of Tasmania's Hobart City Campus. All participants were allocated a unique identifier in the form of a pseudonym. Interviews were conducted by several of the researchers (MD, PVD, and MO) all of whom were experienced interviewers, and did not work directly with the participants being interviewed. A semi-structured interview guide was used to elicit participants' understanding of the factors involved in patient flow management. A set of questions were used for all participants, and more in-depth information was obtained by using prompting questions. Participants were given the option of withdrawing their participation after interviews had concluded; however, none opted to do so. All interviews (n=13) lasted between 14 and 48 minutes and took place between May 2022 and January 2023.

DATA ANALYSIS

Interviews were digitally recorded and then transcribed by a third party, before being analysed using a thematic network analysis [25]. Thematic networks aim to explore the significance of an idea or understanding of an issue. The analysis involves the following stages: code material; identify themes; construct thematic networks; describe and explore thematic network; and interpret patterns. Each stage of analysis involves interpretation leading to an abstract level of analysis, by developing basic themes, organising themes, and overarching global themes. These latter themes group the meaning of the basic and organising themes, showing the meaning of the data [25]. In this study, global themes represent the position of the participants regarding patient flow issues. All transcripts were checked by two members of the research team to ensure accuracy and to improve rigour.

ETHICAL APPROVAL

Ethical approval was obtained from the Tasmanian Health and Medical Human Research Ethics Committee (HREC No 23633) and site-specific approval from the Research Governance Office of the Tasmanian Health Service.

RESULTS

The main areas of discussion in the interviews focused on facilitators, barriers, and potential solutions to an optimal patient flow. Data sufficiency was reached after 13

interviews, as no new insights emerged. Four global themes were developed through the process of data analysis: Managing Patient Flow, Communicating for Decisions, Tools as Enablers and Barriers, and Increasing Complexity.

Theme 1: Managing Patient Flow

The global theme of 'managing patient flow' involved known and unknown demands. The unknown demands were derived from receiving direct admissions via outpatient clinics and general practitioner clinics, causing issues in finding beds for patients who required admission. Direct admissions were not incorporated in daily planning, and therefore, beds were often not allocated as needed. Most participants regarded the role of the PFMs as key in ensuring that patients are placed in a bed located in an appropriate clinical area. This concept was referred to as 'getting it right'.

Getting the patients in the right location for their care. That's what patient flow is about. It's about the right patient in the right location, getting the right care. (Participant 4)

The PFM role was likened to being a chess player moving pieces around on a board. PFMs were in control of most of the patients' movements and their role required looking ahead for potential good matches between a patient's requirements and the appropriate bed.

When you see a good move, look for a better one. (Participant 6)

The role concentrates on improving safety, dealing with patients' behavioural issues, and working on better patient outcomes.

A stroke patient goes to the stroke ward, it's been demonstrated that they have a lesser length of stay, and they end up with less complications. It's easier for the nurses. It's easier for allied health staff it's easy for the doctors to see them, review them, and doctors aren't having to go here, there in the hospital, everywhere, just to find their patients. (Participant 7)

Their role was defined as complex, requiring clinical skills, and good understanding of clinical capacity. The role was seen as challenging at times, due to competing demands, and as sometimes being emotionally draining.

Quite often, patients more with elective theatre cases will be postponed. That really sticks in my craw. Um, because

quite often these patients have waited a long time for theatre. it puts their lives out of kilter as well. (Participant 9)

Theme 2: Communicating for Decisions

This global theme highlighted that effective and efficient communication is vital in reducing confusion and ensuring that patients receive the right care. It was found that at times disagreements between clinicians led to delays in getting patients transferred to the most suitable wards. To establish more effective and efficient communication, morning 'safety huddles' were introduced to discuss admissions and discharges. From the perspective of the participants, the conversations centred on the exchange of information about issues potentially affecting patients and staff in providing the best patient journey possible.

There's a meeting every day at 8:15, where all of the stream leads, and the Assistant Director of Nursing and facilities, and cleaners and everyone meets, and goes through a summary of the organisational status, for ten minutes. (Participant 8)

Although these huddles contributed to better planning, often the quality of communication declined during the day and evening. This meant that delays in making decisions about patient admission, transfer, and discharge occurred. Repeated processing was a common theme shared by many participants. This was exemplified by the process for admitting patients, where patients in the ED are often assessed by three different medical teams, causing significant delays.

The admission process usually happens in ED. Um, and that's where, say it was a Gen Med patient, a Gen Med doc will go down and admit the patient, sort the paperwork. Sort what the care plan for this patient is. And then, once that admission is done, the patient's then moved up, is ready to move up to the ward. But, at times Gen Med refuses to accept the patient and the process starts again. (Participant 10)

Theme 3: Tools as Enablers and Barriers

A wide variety of barriers and enablers exist in using tools designed to assist patient flow. The tools identified in this study included a range of technology-based programs that are designed to aid in the management of patients. They include Patient Flow Manager, Trak-ED, iPatient Manager (iPM), Emergency Theatre Booking System (ETBS), ED Navigator, and Medtasker. The use of multiple software programs, and how information derived from these

programs contributed to losing oversight of patient movements. Participants articulated that software programs are only useful tools when the information they produce assists with the task to be achieved, which was not always the case. Participants then spoke about the use of paper-based lists, printed information and verbally received information as other tools for communicating about patient flow and managing the clinical and administrative loads. Many of the participants took a pragmatic approach to handling patient flow by using all methods available.

The processes that are involved with patient flow is using the systems that we have available to see, to visualise, where patients are and where they need to go. (Participant 1)

Some of the other barriers identified related to staff members not documenting the correct information into the system.

People often don't realise what sort of information they can get out of it. (Participant 3)

The wide range of patient management tools, often used inconsistently, led to fragmentation and invisibility and many participants spoke about staff members' lack of awareness of the capabilities of what was available. Participants spoke about the lack of knowledge, education and training for new and existing staff in the use of patient flow tools, and this was regarded as a major barrier in managing patient flow. Another barrier identified by many participants was accessibility, which related to the limited number of software licenses available to access the tools.

Parallel systems used by authorised person, are not available by all. (Participant 5)

Not having access to the software often led to frustration, shared by many of the participants. Participants spoke about enablers that could lead to better patient flow and this involved removing the restrictions so more staff members would have an overview of the patients' journey. A 'wish list' was mentioned, and for many participants, at the top of this was a single tool incorporating all information required to make the best decision possible, making the use of the multiple existing tools redundant. The need for a predictive tool was expressed by many participants and

related to how many admissions the hospital can expect daily, based on historical data and statistics.

We are expecting 20 discharges. We've only got four that are confirmed. So, until they're confirmed, we can't do anything about anything. So, we've got four confirmed. We've had two that are gone. We've got all of these patients coming in. So, in your head, you're going, okay. Right. So, I can allocate those ones, but I can't allocate those, and all that might happen. (Participant 11)

Theme 4: Increasing Complexity

The global theme of increasing complexity relates to a range of activities and decisions that contribute to ineffective and inefficient patient management in the ED. This includes, among other factors, a high demand for the hospital system due to an increase in patients presenting to the ED and clinically inappropriate patient stays.

We had patients stay over 12 months in a hospital bed because they can't get National Disability Insurance Scheme funding, and there's nowhere for them to live. (Participant 12)

The other issue raised related to inappropriate allocations, whereby patients presenting with medical issues were allocated to surgical beds, potentially leading to the cancellation of elective surgical procedures.

They have got 20-something patients from Medicine in their beds today, so they can't operate on someone if there's no bed to put them in at the end of the day. (Participant 2)

At times patients were placed in beds not suitable for their medical condition, creating a need for them to be relocated to a more appropriate bed in a different clinical area. Participants reported that this often leads to frustration, as an optimal decision is not made.

It has been quite often we're put in a position that we don't get to make the ideal decision because those beds aren't available. (Participant 13)

Participants spoke about the nursing workforce becoming specialised and that nurses working in one specialty did not have the skillset to care for a patient who did not have a condition falling under that specialty. This issue contributed to patients not being able to be transferred from the ED to certain clinical areas. Patient complexity was identified as a contributing factor to patient flow issues. For example,

patients who required telemetry often waited longer to be transferred, as beds equipped with telemetry were scarce. High acuity patients could interfere with patient flow, as at times the most appropriate ward had many high acuity patients, creating barriers for staff to provide safe care. Patient preferences also played a role, as at times same-gender rooms were requested.

DISCUSSION

This study aimed to explore and understand the factors that influence patient flow management at a referring hospital in Tasmania, Australia. It has become clear that these factors are complex in nature, and that patient flow management appears to be a major problem contributing to poor patient and staff experience. As seen in this study and consistent with the observations of He et al., the complexities in inpatient bed management are caused by multiple factors such as “the uncertainty of patient arrivals, length of stay (LOS), limitations in staff and resources, lack of communication, cooperation, and transparency between different units and facilities, and timely information sharing” (p451) [9]. Patient flow as a complex phenomenon requires system-level change, requiring the full attention of executive healthcare managers in order to develop and execute plans addressing the issue in a holistic way. However, a systems level change might not always be achievable and therefore initially focusing on tools supporting decision making could be a good first step in improving patient flow in a complex world.

In this study two themes, Managing Patient Flow and Tools as Enablers and Barriers, highlighted that current methods used to provide patients with the best journey possible are hindered by the wide variety of tools available and their inconsistent use. This can be seen as overprocessing and not adding value to the process [22]. An overarching tool (software) which incorporates all information required to aid patient flow decisions would hypothetically be useful. However, it may not be feasible to develop such a tool that is readily accepted by all user groups. An alternative may be to develop a predictive tool that could accurately forecast patient arrivals by the hour of the day, enabling planners to match staff to meet anticipated patients, reconfigure units, and redeploy staff [23]. The development of a predictive tool could lead to more sophisticated resource management, creating a more ‘Lean’ flow by reducing waste. Linking forecasts of arrivals with upstream

(ambulance callouts) and downstream (e.g. LOS) analytics could also lead to more holistic decision-making.

The issue of staff not being qualified to care for certain patient cohorts, as found in this study, calls for strategies of flexibility in allocating experienced staff to areas in need. It is known that the provision of optimal care relies on integrative activities such as mobilisation of appropriate people and resources [29]. Enhancing human capital or the skills, experience, and knowledge gained by an employee to perform the job well can be key in the organisation's ability to allocate patients to appropriate beds [30]. An organisational unit dedicated to continuous learning, supported by a university should be part of the strategy within healthcare organisations, to meet training and education needs [30] and support health service improvement research and projects. The other strategy to consider is targeted education by rotating staff through different clinical areas, facilitating the transfer of clinical knowledge, as this knowledge grounded in the evidence is a priority characteristic for providing the best care possible [29].

In this study several waste activities were identified such as *overproduction*, *waiting*, and *transportation* [15]. Overproduction evidenced by the number of physical examinations patients received can be seen as repeated work [31]. Streamlining admissions by reducing the number of patient assessments and by allocating the responsibility for admission to ED physicians could streamline the process of allocating beds and moving patients to ward areas. This strategy has been employed in other jurisdictions whereby patients were examined by a senior physician in a fast-track model, demonstrating positive effects on wait time and LOS [32]. The implementation of a standardized multi-disciplinary consultation or team-based care model, whereby senior doctors, junior doctors, and nurses working together can contribute to better patient flow [29]. Changing models of care has implications for clinical governance, and building frontline capacity, engagement, and developing communication plans with executive sponsorship are essential to ensure successful implementation [33]). Other strategies could involve the employment of nurse practitioners helping to fast-track patient examination. Well-designed ED models of care involving nurse practitioners can lead to improvements in flow and elimination of waste [34]. These strategies can decrease ED boarding time (the duration between ED admit decision and ED departure time) contributing to improvements in patient flow [35])

What has become clear, from an operational point of view, is how the daily bed allocation decisions were made. Allocating patients in the most appropriate bed surfaced strongly among the participants of this study as an important part of their role. It was evident that a number of patients were placed on clinically inappropriate wards, which may have affected patient experience, patient safety, and the quality of care [36]. Therefore, it is crucial that patients are allocated the most appropriate bed, and this might be through developing an event simulation model representing emergency and elective admissions into inpatient wards mimicking allocation decisions, providing the best way to allocate the available beds among hospital wards [37].

LIMITATIONS

The findings of this study are constrained by some limitations. The study cohort consisted of clinicians who were directly involved in patient flow, but no patients with lived experience were interviewed, which may have led to a limited range of perspectives. The interviews were conducted in one organisation within one Australian state and therefore the results may not be fully representative of those in other jurisdictions. However, further replication of the research approach may be useful to help inform patient flow issues for healthcare organisations in similar contexts.

CONCLUSIONS

This research has demonstrated that obtaining the perspectives of patient flow experts is vital in understanding the issues surrounding patient flow. It has become clear what these issues entail and that they relate to unknown demands, ineffective and inefficient communication, patients placed in beds not suitable for their medical condition, and sub-optimal decisions. Moreover, the inconsistent use of a wide range of patient management tools contributes to fragmentation and lack of visibility. It is important to understand the contextual differences to develop and implement suitable and sustainable solutions, which may be in the form of an overarching prediction and decision support tool and streamlined processes for patient assessment.

AUTHOR CONTRIBUTIONS:

For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used

“Conceptualization, PVD, MD MO, RT and JM.; methodology, PVD, MD, MO and RT; formal analysis, PVD, MD; investigation, PVD, MD and MO.; writing—original draft preparation, PVD, MD and SP.; writing—review and editing PVD, MD, SP, MO, RT and JM.; project administration, PVD, MD.; funding acquisition' PVD, MO, RT and JM All authors have read and agreed to the published version of the manuscript.

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CONFLICTS OF INTEREST:

The authors declare no conflict of interest.

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