Canadian Journal of Health Technologies

CADTH

December 2021 Volume 1 Issue 12

CADTH Health Technology Review

Contributing Factors to Acute Care Hospital Flow: International Ideas

Policy Insight

CADTH

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ISSN: 2563-6596

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Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

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Key Messages

- High-functioning acute care hospitals enable efficient patient flow from admission to discharge with the right care from the right providers at the right time.
- Barriers to patient flow can result in cascading events and contribute to patient harm and caregiver burnout.
- Quality improvement endeavours in the UK, Switzerland, Finland, and the US have shown success through addressing workplace culture, utilizing management and process theories, altering roles and responsibilities, and taking advantage of technologies.
- Successful and sustainable improvements tend to involve substantial planning along with engagement of stakeholders in the design and implementation of a tailored approach.

Issue and Background

Acute care hospitals are designed to provide concentrated health care services, aligning various members of the multidisciplinary team in 1 location. Along with health care professions conducting continuous monitoring and interventions are the diagnostic adjuncts of medical imaging and laboratories, as well as access to expert consultation. Patients become admitted to an acute care hospital through emergency departments (EDs), following elective surgeries, from primary care providers, or transferred from other health care facilities. In all cases, there is a need for a progressive flow through the acute care hospital. This flow requires the coordination of team members and resources, effective communication among the team, and clear identification of the rationale for hospital admission. This latter aspect allows a team of rotating individuals to remained focused on addressing the patient's needs with a goal of a safe discharge to their home or another facility with the needed resources in place. The ultimate achievement of patient flow from admission to safe discharge in an efficient manner not only meets individual patient's needs, it also makes the best use of hospital resources, rendering the hospital high functioning.

High functioning hospitals have an intelligent physical and infrastructure design, with established, efficient team dynamics, communication plans, and ideal processes in place. However, many hospitals struggle to achieve this ideal. Breakdowns in communication, lack of alignment among health care providers, inexpedient diagnostic information, inaccessible consultants or specialists, and overstretched resources within the hospital and allied facilities or services can all lead to a breakdown in flow and delays in discharge. In the UK, the National Health Service (NHS) estimates 1.15 million bed days are lost each year because of delayed discharges.[1] In Canada, for 2019 to 2020, the Canadian Institute of Health Information reports 3 million days of a Canadian hospital bed occupied by a patient for whom another setting was more appropriate.[2] With these discharge delays, lack of flow, and misalignment of resources comes a cascade of other harms and risks. Surgeries are cancelled, overcrowding becomes common, health care staff suffer burnout, and patients are put at risk.

Several countries have recently reported progress in various areas resulting in greater numbers of high functioning hospitals. Looking specifically at the UK, Switzerland, Finland, and the US, this paper will explore a selection of studies of high functioning hospitals and the interventions explored to achieve this status.

Policy Implications

This paper describes both the aspects that define a hospital as high functioning, and the necessary approaches that were undertaken to transform a hospital to this status. Two common themes emerge in the studies related to this latter transformation:

1. The need to invest resources and time in planning an improvement intervention before implementation.
2. Engagement of stakeholders in defining the areas in need of improvement as well as the improvement intervention that will be unique to each hospital setting.

Whether in the application of management and process theories, when addressing relationship dynamics and roles, or in using technologic adjuncts, the status of high functioning hospital was achieved and maintained through involving stakeholders in the creation and implementation of the quality improvement endeavour specific to each setting. The concepts of the interventions are introduced in this paper rather than their specifics due to this consistent finding throughout the literature that specific interventions be tailored to each setting through the engagement of key stakeholders.

Workplace Culture

In 2016, researchers undertook a dual-purpose study of Yeovil District Hospital (YDH), in South Somerset, UK. The Royal College of Emergency Medicine had set quality indicators for NHS EDs of no more than a 4-hour wait time, no patients leaving the ED without having been seen, no patients requiring reattendance to the ED within 7 days, and a trend in reports of positive experiences from ED patients.[3] There had been agreement among YDH administration that investing in better patient flow through the hospital and the emergency department could help meet those quality indicators as well as assist with improvements in other areas of the health care ecosystem such as avoiding the cancellation of elective surgeries.[3] However, previous attempts at strategies to address flow-related operational inefficiencies had proved unsuccessful. Therefore, when 2 attempts at quality improvements were undertaken within a short time frame with the second being much more successful than the first, they were able to report on the effects of attending to inpatient flow as well the differences in the approaches of the 2 endeavours.

In the first intervention, the attempts to improve inpatient flow were found to be unsuccessful due to a mismatch between what management viewed as operational efficiencies and what the health care professionals viewed as high-quality care.[3] The second intervention involved a significant upfront investment in staff engagement to develop a successful design.[3] With this increased engagement, the stakeholders of the multidisciplinary team, administrators, and patients all contributed in the following ways:

- articulating a shared goal that aligned with stakeholder's values
- employing a diverse, multidisciplinary team
- defining a set of outcome-specific routines
- sharing an ongoing understanding of the problems
- incorporating patient and clinical feedback

- realignment with what is important to patients
- support of implementation of new routines.[3]

The interventions of the second project included focused care for the elderly, maintaining bed availability, reducing patient length of stay, and avoiding unnecessary admissions, which were positive for both inpatient flow and emergency patient flow.[3] In addition, the authors concluded the following related to implementing and maintaining quality improvement endeavours:

- Do not just address organizational change, but also cultural change (involvement of staff in the decisions and process).
- Do not focus on just 1 variable. Although the individual areas of improvement were only marginal, the effects of their combination were substantial.
- Improvements are likely context specific and need to be developed by staff for their own environments. What worked in 1 setting may not work in a different setting.[3]

Management and Process Theories

Lean

The lean philosophy is understood to have originated in Japan in the automobile manufacturing industry and was largely based on decreasing costs and increasing profits by eliminating wasteful approaches. However, critically examining the usual processes in health care delivery, to increase efficiencies and eliminate that which does not add value has potential benefits in better care and better patient outcomes with less resource consumption.

The Hospital District of Helsinki and Uusimaa (HUS) is a group of public health care organizations in Finland that includes 22 hospitals, 23,000 workers (including 3,000 doctors and 12,000 nurses) that provides care to 1.6 million people across 24 municipalities.[4] Markku Mäkijärvi, Chief Medical Officer, and Jyrki Perttunen, Lean Projects Director chose to report on their endeavour of implementing lean processes in 1 of Finland's largest hospital districts due to the successes in health care improvement, and the successes in their implementation strategy.

The driving force for implementing lean at HUS was to find ways to do more with less because the demand for service was increasing when the health care budget was not. Their strategic approach to find success in the implementation was to take their time, start in non-clinical areas with a greater chance of uptake, train champions, and empower them to be self-starters, and then celebrate successes with spread and scale.

About 100 coaches who were mostly doctors and nurses were trained as lean champions who could initiate projects on their own. The first setting was in the laboratories and the medical imaging departments where the successes were celebrated, sparking curiosity in the clinical departments.[4]

Concurrently with clinical and diagnostic areas, the leadership team incorporated lean training for managers focusing primarily on communication across organizational levels. Throughout the organization, the work environments improved which led to more uptake and faster transformation. Progress was evident in the ever-increasing levels of cross-functional

collaboration with multidisciplinary huddles becoming the norm replacing single profession networking.[4]

Although the authors of this report and the leaders of the lean implementation sought to celebrate their successes and share their story, they do not recommend copying what they did. They admit to taking advice from consultants and borrowing ideas from other lean health care organizations, but in the end the customized approaches and techniques were their own, specific to their organization and each department, and they encourage others to make any lean approaches unique to each organization.[4] There are a multitude of lean strategies and processes that are applicable to health care that could be tailored and applied to any hospital and department.

Leeds Improvement Method

Leeds General Infirmary is a large teaching hospital located in Leeds, UK that performs over 3,000 neurosurgical and spinal operations per year.[5] The neurosurgical critical care unit noted on an internal audit that there were significant issues in flow related to delays in discharge, defects in the use of the electronic patient management system (EPMS) and the electronic staffing record (ESR), poor communication between bed managers, and unclear roles among staff, all culminating in 40% of planned surgeries being cancelled.[5]

Significant, sustained improvements were reached through adapting a quality improvement system to the neurosurgical unit, making improvements that were decided on by key stakeholders and tailored to their unit, empowering key players, and using the stepwise "plan, do, study, act" (PDSA) cycles through multiple iterations. The Leeds Improvement Method was derived from the Virginia Mason Production System and the Toyota Production System involving lean methodologies toward efficient productivity. These principles included:

- removing waste
- eliminating rework
- levelling workload
- standardizing tasks
- continuous improvements
- decisions by consensus with rapid implementation.[5]

Dedicated, empowered staff and team leaders took the above principles and results of their internal audit and came up with the following interventions:

- No use of paper staffing records and zero defects in the ESR.
- Elimination of defects within the EPMS.
- Visible step-down status of patients within critical care.
- Reduction in the time taken by bed managers to collate bed and staffing state.
- Easier staff shift transitions.[5]

Through 5 PDSA cycles and a follow-up study, key hospital processes were reduced from 50 minutes to 9 minutes; 71% defects in the EPMS were reduced to 0%; 100% defects in the ESR were reduced to 4%; delays in discharge were reduced from 80% to 20%, and number of cancelled elective surgeries were reduced from 9 cases per 30 days to 1 case over 30 days post-intervention.[5] The authors conclude that a significant lesson that contributed to the

success of this endeavour was having key people's buy-in at an early stage, which helped drive the project forward.

Whole Systems

When studying overcrowding in ED in Southeast England, researchers in Canterbury, UK noted that there was support in the literature to apply a whole systems lens. Their approach was based on the stance that a combination of practical methods and theory used to view complex issues as an interconnected whole rather than their actionable parts was best.[6] The whole systems approach is thought to address the complexity of population health care needs and lead to sustainable quality improvements through reducing duplication and waste and improving both health outcomes and patients' experiences.[6]

The researchers sought to find the patterns that exist in health care relationships, beliefs, traditions, values, and assumptions. These patterns are thought to drive the thinking and behaviour that result in overall organizational effectiveness, as well as staff recruitment and retention. Further, any quality improvement initiatives, leadership endeavours, and attempts at innovation that only focus on processes or structure and not on the patterns of the whole system are bound to be unsustainable.[6]

The research was informed by systems thinking, and involved gathering stakeholders, conducting interviews, surveys and appreciative inquiry; applying process mapping, identifying pathways and "swim lane" maps; clarifying enablers, inhibitors, interdependencies, and pinch points; and the use of what the researchers called a miracle question: "what does ideal look like?"[6] That question resulted in a comprehensive characterization of a person-centred, evidence-based, safe and sustainable system focused on health and social care.[6] Comparing the ideal system with the results of the inquiry identified 3 overarching gaps: fragmented leadership that resulted in duplication and waste; the lack of a competency framework to guide staff recruitment and development; and the lack of a team approach.[6]

It is apparent from the report that the whole systems approach not only delved deeply into the relationships and dynamics of the health system studied, but the engagement of the stakeholders that included administration, staff, and patients resulted in investments into sustainable improvements.

Roles and Relationships

Nurse Practitioner and Physician Collaboration

To explore innovations within urgent and emergent care in London, UK, many hospitals introduced Urgent Care Centres (UCC) and some undertook using new roles for both general practitioner physicians (GPs) and emergency nurse practitioners (ENPs). Researchers in 1 centre took a qualitative approach to examine the team dynamics and development between GPs and ENPs in the hopes of informing future UCC models toward efficient development of effective teams. The rationale for examining these aspects is the findings from other studies that high functioning teams have a positive influence on patient safety, patient satisfaction, staff retention, and hospital costs.[7]

Through open-ended semi-structured interviews, the researchers learned from GPs, ENPs, receptionists and managers about how team dynamics had evolved in the 3 years since the introduction of this staffing model. Like most teams, the stages of forming, storming, norming, and performing were evident, but further analysis revealed 8 facilitating factors toward the final performing aspect of the GP and ENP teams:

- Appointment of leaders.
- Perception of fair workload.
- Education on roles and skill sets and development of these.
- Shared professional understanding.
- Interdisciplinary working.
- ED collaboration.
- Clinical guidelines.
- Social interactions.[7]

When comparing their findings to the literature, there was overlap in the 8 facilitating factors from this study and the 4 key components of the TeamSTEPPS instructional framework for integrating teams in a health system:

- Good leadership.
- Communication.
- Mutual support.
- Situation monitoring.[7]

Further, the collaboration of the GPs and ENPs was positive to the functioning of this health centre, the staff morale, the patient satisfaction, and was associated with positive health outcomes. The authors posit that applying their findings or similar team development strategies, while making them relevant and specific to the health setting in question can shorten the forming and storming phases resulting in an effective team more efficiently.[7]

Knotworking

There are inherent risks to patients' wellbeing in an ED. Some of this is related to the fact that many of the people who arrive to the department are in a medical or trauma-related emergency, but this is also compounded by the fact that many are not. A multidisciplinary team needs to assess, prioritize, communicate, differentiate levels of acuity, reassess, monitor, intervene, and manage the flow in this often-overcrowded environment. Some patients will need to be admitted to a hospital ward and service, others are discharged with follow-up appointments and instructions, and whether due to pain, confusion, frustration, or impatience, most patients are anxious and in need of various levels of therapeutic communication.

With this setting in mind, researchers at the UK's NHS set out to examine interprofessional barriers, defined as suboptimal ways of working, as perceived by ED staff with respect to flow management.[8] Flow management, according the literature, is affected by staff beliefs around clinical safety, teamwork, and organizational structure, which in turn comprises complex interdependencies and changing boundaries.[8] Tasks in emergency can be unpredictable, urgent, and complex, and involve both teamwork, and team role blurring, and are further complicated by political pressures, targets, and various levels of managerial oversight.[8] To assist with describing this dynamic, these researchers relied on a concept described in the

literature as *knotworking* — a team dynamic that tolerates high levels of ambiguity and allows for teamwork during times of maximum complexity without falling into chaos.[8]

Through semi-structured interviews, data collection and analysis, the researchers described interactions characterized by pace, fluidity, and agility in accomplishing clinical decisions. The knotworking was evident in the flow-related processes of teamworking, performance management, and referrals. The workflow in the busy, overcrowded ED was described by the researchers as "messy" with an often unclear division of labour between the professionals related to assessments and treatments. However, the knotworking dynamic was viewed as an asset that allowed for multitasking and led to efficiencies while overcoming cognitively taxing aspects of managing ED flow.[8]

A conclusion for the researchers of this study is that patient flow is much more than the sum of processes; it involves complex interactions that are difficult to describe but are somewhat captured with the notion of knotworking. When it comes to quality improvements in EDs and addressing patient flow toward high functioning hospitals, it is necessary for administrators to appreciate these complexities. A full understanding may not be possible for someone who has not worked in or studied these dynamics. For these reasons, it is important to involve ED staff and stakeholders in any quality improvement endeavours to the ED setting.

Technological Adjuncts

Artificial Intelligence (AI) and adopting perspectives from high-reliability organizations (HROs) have both slowly been surfacing in the health care world, particularly in medical imaging and quality assurance, respectively. The NHS in the UK has plans on introducing both AI and HRO attributes in an AI Command Centre in a large 800 bed hospital in Bradford, UK.[9]

AI often combines the concepts of machine learning with advanced computer systems for the purposes of consistency and precision. In the area of medical imaging, this has been used as an adjunct to overcome the issues of inter- and intra-person reliability. HROs are entities like nuclear powerplants and aircraft carriers that operate with significant risks and very little room for error. Studies of these organizations have revealed a tendency to not avoid the notion of errors, but embrace it through 5 key principles:

- A preoccupation with failure: constantly looking for what could go wrong, and how.
- A reluctance to simplify: always dig deeper and do not make assumptions about cause and effect, especially with problems.
- Sensitivity to operations: always looking for the big picture and employing whole systems thinking.
- Resilience: developing the capability to cope with unexpected events while always committing to excellence.
- Deference to expertise: keeping a low threshold for seeking expert input.[10]

As of March, 2021, an evaluation of the safety and patient impact of an AI Command Centre in the NHS was under way.[9] Taking advantage of the precision and objectivity of AI along with the HRO approach to dynamic risks and organizational complexity, this undertaking could prove very valuable to hospital flow and patient safety. Results from the study were not available at the time of compiling information for this paper.

Use of Apps

Also currently under way as of September, 2021 is the trial of an innovative use of technology to assist with patient flow, communication, status updates, and individualized discharge planning in Salford, UK.[11] The application is being trialled over 6 months by 20 Flow Facilitators across multiple surgical and medical units. Many of the delays and pitfalls in successful discharge plans that set patients up for success is the real-time alignment of laboratory and medical imaging data, multidisciplinary communications, follow-up plans, and addressing questions and concerns from key stakeholders, including the patient. The Patient Flow Tasks app is designed to address these issues through using technology at the patient's bedside, promoting teamwork and ensuring a patient focus.[11]

There are an ever-growing number of health apps designed for consumers of health care services in England, a few in formation to assist with patient flow as described above, and 1 described by researchers at a UK hospital to assist with physician availability.[12] One of the barriers to patient care and flow through the hospital systems in the UK is the availability of locum physicians. Further, technological innovations in health care such as Electronic Medical Records vary in their acceptance and adoption if not found to be beneficial and supported beyond their pilot phase. Therefore, researchers sought to explore through semi-structured interviews, the contributions of technology to the streamlining of workforce planning, qualitative aspects of locum work, and adoption of technological innovations by this cohort.[12]

The researchers used their analysis to propose an Information Exchange System model outlining the information flow underpinning workforce planning in hospitals in England. However, for the purposes of this paper, the relevant conclusions were that technological innovations are more fully embraced and adopted when tied to mutually beneficial outcomes for all of the involved parties; in this case hospital coverage from the manager's perspective, and predictable shifts and income for the locum physicians.[12]

Emergency Department Focus

A 2013 audit of NHS hospitals found 14 with a mortality rate much higher than expected.[13] In response to the root cause analysis, Medway NHS Foundation Trust instituted educational programs and the introduction of new processes and roles. Researchers examined hospital indicators and concluded that by 2016, the instituted changes had resulted in this hospital having the best performing ED in Southeast England.[13] Aspects of both the audits and results of the instituted changes could be applied to other EDs worldwide.

Areas of concern for this hospital included a lack of nursing leadership and inadequate investments in professional development. The ED had not been using a standardized triage tool, and inadequate assessments were evident in the audit. These factors were compounded by suboptimal staffing levels, overcrowding with patients, and a layout that did not allow for ongoing monitoring of the patients.[13]

In addition to adopting a standardized triage system and educating all nursing staff, the processes of the hospital were changed such that nurses were empowered to initiate diagnostics and treatments. Senior nurses were put in a rapid-assessment practitioner role that enabled treatment and referral to specialist teams or other providers. This may have prolonged the initial assessment process, but it provided continuity, fewer reassessments,

better patient care, and took advantage of advanced knowledge and skills of senior nurses. Finally, attention was given to flow and safety at each stage, from triage, transitions in care, communication between teams, and appropriate discharge preparation with patient and caregiver teaching.[13]

Inpatient Department Focus

The most common reasons for hospital admissions in Canada, in order, are giving birth (average stay 2.2 days), chronic obstructive pulmonary disease (average stay 7.1 days) and acute myocardial infarction (average stay 4.9 days).[2] Patients who remain admitted solely because a more appropriate setting is not available (such as long-term care, rehabilitation, or the option to discharge home with community supports) referred to as Alternative Level of Care patients, comprise 5.3% of hospital stays on average across Canada.[2] These patients often remain admitted for weeks to months and therefore tend to be the focus when examining flow and appropriate discharge plans. The cascade of effects of having patient remain admitted in hospital longer than 2 to 7 days includes overcrowding in ED, cancellation of surgeries, a misalignment of staffing and other resources to patient needs, and the associated risks of each. A recent UK study looked at a combination of mortality markers (hospital standardized mortality ratio, summary hospital-level mortality indicator, and monthly crude mortality), and found that a reduction of bed occupancy from 93.7% to 90.2% resulted in a statistically significant trend of decreased mortality rates in all markers.[14] Moreover, the risks are not just to the other patients needing hospital services. UK studies suggest that for every day beyond a 12-day hospital stay, older patients lose 5% of muscle strength.[1]

The Agency for Health care Research and Quality in the US released in September 2021 a review of the literature of US-based studies looking at interventions to reduce hospital length of stay (LOS).[15] Nineteen systematic reviews described 8 strategies that address LOS under the following headings:

- discharge planning
- geriatric assessment or consultation
- medication management
- clinical pathways
- multidisciplinary care
- case management
- hospital services
- telehealth.[15]

From the review of the studies, the authors conclude that hospital administrative leaders can do the following:

- Understand the different populations with varying risk levels within hospitals attempting to reduce LOS.
- Explore specific interventions matched to medically complex, high-risk, and vulnerable populations with higher LOS.

- Maximize expertise of current staff when identifying and implementing system-level interventions (e.g., clinical pathways, geriatric assessment).
- Understand trade-offs between reducing LOS in medically complex, high-risk, and vulnerable populations and other patient-centred outcomes (e.g., functional decline, patient experience, mortality, readmissions) and patient safety and quality metrics.
- Evaluate opportunities to support research and implementation of system-level interventions targeting medically complex, high-risk, or vulnerable populations.
- Work with policy-makers and key stakeholders to identify best approaches to reducing hospital LOS.[15]

The authors of this review suggest that further research is needed to explore operational aspects of the above themes. Their intent was to group and describe key contextual factors such as resource allocation, staffing needs the role of leadership, and organizational culture that play a role in hospital LOS and flow.

Conclusions

The challenges and risks associated with the misalignment of resources culminating in increased length of hospital stays is a worldwide problem. However, there are strategies being employed in all countries to explore and address this. In response to a specific request, this paper examined recent studies in the UK, US, Switzerland, and Finland. An overview of some of these strategies that address workplace culture, utilize management and process theories, explore approaches to roles and responsibilities, adopt technological adjuncts, and address flow in ED and inpatient units reveals a common theme: successful endeavours are those that are tailored to each organization, and those that involve the stakeholders affected by the change. Further, although not highlighted in the studies reviewed in this paper, the main stakeholder in health care endeavours and improvements is the patient, and it is widely viewed as best practice to involve the patient's voice and perspective as much as possible.

The findings from these studies are consistent with the stance of Margaret Wheatley, stated very aptly in her book *Leadership and the New Science*, "we know that the best way to create ownership is to have those responsible for implementation develop the plan for themselves. No one is successful if they merely present a plan in finished form to others. It doesn't matter how brilliant or correct the plan is: it simply doesn't work to ask people to sign on when they haven't been involved in the planning process."[16]

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Appendix 1: Literature Review

A targeted literature search was conducted by an Information Specialist at CADTH on key resources including MEDLINE, as well as a focused internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were patient flow, hospitals, policy or organizational aspects, and the geographic regions listed below. The search was limited to documents published between January 1, 2016 and September 22, 2021.

Research Questions

1. What core hospital-based processes and approaches (ex. Specific operational models, strategies, policies, frameworks, technologies) related to patient flow, occupancy, and over-capacity issues do the following high functioning hospitals use: the UK (NHS), Switzerland, Finland, and Kaiser Permanente in Washington in the US?
2. Is there evidence to support the use of these approaches?

The resulting studies were reviewed based on their title and abstract for relevance to the research questions and to the scoping undertaken with the requesting customer. A selection of studies was examined in detail.