

TRANSFORMATION

Lean thinking in emergency departments: concepts and tools for quality improvement

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Abstract

The lean approach is a viable framework for reducing costs and enhancing the quality of patient care in emergency departments (EDs). Reports on lean-inspired quality improvement initiatives are rapidly growing but there is little emphasis on the philosophy behind the processes, which is the essential ingredient in sustaining transformation.

This article describes lean philosophy, also referred to as lean, lean thinking and lean healthcare, and its main concepts, to enrich the knowledge and vocabulary of nurses involved or interested in quality improvement in EDs. The article includes examples of lean strategies to illustrate their practical application in EDs.

Keywords

change management, continuous improvement, emergency department flow, emergency nurse, employee engagement, lean thinking, performance management, process improvement, nursing management, quality improvement

Introduction

Improving the quality of care in emergency departments (EDs) has long been a priority in all healthcare systems. Nurses are required to deliver high-quality care within an increasingly complex system, influenced by government reforms and market expectations. Most EDs are adapting by investing in new infrastructure, technology and organisational approaches designed to manage change, such as electronic health records, Six Sigma and simulation modelling (Duguay and Chetouane 2007).

Among the growing list of quality improvement models, lean has emerged as a viable approach across different levels, including patient experience, work design and nurses' experience. Lean thinking is centred on eliminating waste so that all work adds value and serves customers' needs. The principles of lean have been used traditionally in the manufacturing industry but in recent decades service industries, such as retail, travel and government, have imported lean strategies effectively into quality improvement programmes.

Lean management philosophy: main concepts

Lean is an operating philosophy derived from the Toyota Production System (Liker 2004), which aims to streamline processes to smooth

out the workflow and eliminate wasteful steps. Its application to healthcare lies in how efficiently resources are used, particularly in enhancing the value for patients in each step of the process (Campbell 2009). Arguably, patient outcomes and cost-effectiveness are the most important outcomes for nurses, and the Institute for Healthcare Improvement sets out these challenges as three imperatives: to provide effective, safe, and reliable care to clients, to improve population health and to decrease per capita costs (Berwick et al 2008).

Among the many ways of addressing these goals in EDs, one stands out: optimisation of nursing practice on the service line. By adopting a lean approach in EDs, nursing care processes are rationalised in ways that minimise redundancy and costs, and implement new systems responsive to healthcare needs.

Lean culture in EDs: building conviction for continuous improvement

A lean culture is the foundation from which lean tools and techniques are used, and reinforces the belief that waste equals opportunity. Graban (2011) translated the seven original wastes identified in the manufacturing industry into eight wastes in healthcare (Table 1). In the context of EDs, examples of waste include patient waiting times, unnecessary movement by staff

when retrieving equipment and preparing medication, and defects through medication errors, as well as lost nursing creativity or talent for improving care.

The way in which front-line nurses embrace the potential of lean, through a continuous improvement culture, is critical. The most important element for success is the human element, therefore nurses must be motivated and engaged, and work together towards a common goal. Lean-based projects are an important way of encouraging a culture of continuous improvement and enhancing analytic dialogue between staff.

Nurse managers must therefore recognise the contribution of each team member as crucial to the transformation process. Once front-line staff engage in the continuous improvement dialogue, managers will be expected to lead and coach their nurses on lean concepts and how to apply them to their work.

Process: banishing waste to create value

A process is a sequence of steps each of which must be accomplished properly and in a timely way to create value. When waste, in the form of repeated steps, waiting, rework and unnecessary motion, is eliminated, quality improves, time is reallocated and capital is freed to invest elsewhere (Fine et al 2009). Lean management embraces the notion of counter-intuition.

Traditionally, ED overcrowding is addressed by increasing the number of nursing staff (Protzman et al 2010), but in a healthcare system in which expenditure is carefully scrutinised, a lean mindset would divert from a demand-supply approach, towards a critical inquiry of the causes of the overcrowding. Once the root causes or dysfunctional processes are identified, prioritised and examined, lean tools and methods can be applied to improve them.

Applying lean principles: tools and strategies

Process mapping

To identify inefficiencies in EDs, nurses can use process-mapping techniques such as value stream maps (VSMs) (Singh Gill 2012) and spaghetti diagrams (Donahue 2009). Using these visual aids enables better understanding of a particular flow within an ED and helps identify value-adding and non-value-adding activities, which can then support nurses to prioritise their quality improvement efforts.

VSMs are visual representations that illustrate the progression of patients through different processes in EDs. They involve all the steps required, both value-added and non-value-added, to complete a process from beginning to end. Nurses can analyse the flow of activities, resources and information required to move patients through specific

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TABLE 1. Graban's (2011) eight wastes in healthcare

Type of waste	Brief description	Hospital examples
Defects	Time spent doing something incorrectly, inspecting for errors or fixing errors	Surgical case cart missing an item; wrong medicine or wrong dose administered to patient
Overproduction	Doing more than what is needed by the customer or doing it sooner than needed	Doing unnecessary diagnostic procedures
Transportation	Unnecessary movement of the 'product' (patients, specimens, materials) in a system	Poor layout, such as the catheter lab being located a long distance from the emergency department
Waiting	Waiting for the next event to occur or next work activity	Employees waiting because workloads are not level; patients waiting for an appointment
Inventory	Excess inventory cost through financial costs, storage and movement costs, spoilage, wastage	Expired supplies that must be disposed of, such as out-of-date medications
Motion	Unnecessary movement by employees in the system	Lab employees walking miles per day due to poor layout
Overprocessing	Doing work that is not valued by the customer or caused by definitions of quality that are not aligned with patient needs	Time/date stamps put onto forms, but the data are never used
Human potential	Waste and loss due to not engaging employees, listening to their ideas, or supporting their careers	Employees get burned out and quit giving suggestions for improvement

areas effectively. Improvement efforts can then be aimed at decreasing waiting times from one step to another by grouping previously siloed activities, such as triage and registration (Murrell et al 2011).

A spaghetti diagram is another visual representation tool that uses a continuous line to trace the path and distance a person travels throughout a process. The tool identifies wastes that are hidden in nurses' movement trajectories on the floor. It becomes easier to visualise which movement paths require optimisation by addressing physical workspaces, re-evaluating nurses' tasks and managing inventories. Standard time and motion studies can be used to enhance the reliability of time-sensitive data and evaluate workflows (Zheng et al 2011). In some EDs, data from existing electronic systems can be used to retrieve time and pattern information related to the identified issue.

Kaizen: rapid quality improvement events

Kaizen is a Japanese term that means continuous improvement (Imai 2012), and Kaizen events are concentrated workshops or retreats that aim to develop a practice improvement project. During Kaizen events, traditionally lengthy and cumbersome quality improvement processes are expedited by initiating improvement projects on a smaller and more manageable scale. These intensive four or five-day events give nurses the opportunity to inspect and improve their own work and acquire new quality improvement skills. Kaizen events rally nurses to participate in the process, from identifying the problem to developing an implementation plan.

Lean strategies

Lean strategies include visual management, which incorporates techniques that aim to simplify the execution of work. These include foot-printing, pictograms, floor-marking and replenishment signals (Bendavid et al 2010), which are used to share information efficiently to minimise repetition, quickly ascertain normal from abnormal, and provide clear and distinct visual cues (Aguilar-Escobar et al 2015).

The '5S' method, Sort, Set in Order, Shine, Standardise, Sustain, another visual management strategy, is a systematic approach that allows team members to organise their workplace to optimise their productivity (Grigg et al 2009). The goal of 5S is to have a place for everything and have everything in its place, clean and ready for use. In EDs, having dedicated space for equipment, such

as electrocardiograms and other portable machines, reduces the time and motion wasted on searching and retrieving, especially when carrying out time-sensitive interventions.

Limitations and barriers to implementation

Despite its merits, lean has some drawbacks. For example, research has demonstrated considerable variation in practice, with some organisations adopting a system-wide approach (Lavoie-Tremblay et al 2015), while others focus on single organisational processes and lean tools (Trebble et al 2010). As Goldratt et al (2004) state: 'A system of local optimums is not an optimum system.' Therefore, as nurses integrate lean principles into their practice, they must ensure that their projects align with their organisations' strategic goals.

One way of ensuring initiatives align with organisational goals is to keep a central repository of projects that is accessible throughout the institution. This avoids duplication of effort and enhances integration of resources. Lean affects patients and healthcare employees, therefore research of the undesirable and null effects, as well as its desirable effects, is required.

Other barriers to lean implementation include healthcare practitioners misunderstanding the principles and terminologies, difficulties with data collection, performance measurement and analysis, and differences in departmental cultures in relation to change management (Waring and Bishop 2010, De Souza and Pidd 2011, Chiarini and Bracci 2013, Leggat et al 2015, Noori 2015). Future research may be directed towards examining the factors that contribute to variation in the application, and success, of lean.

A common mistake is rushing to adopt lean tools. This can create short-term value in EDs but does not allow for sustainable transformation. Ensuring that changes endure is only possible by taking a comprehensive approach. Effective lean nurses recognise that transformation produces major improvements in productivity, quality, patient satisfaction, employee engagement and, most importantly, growth.

Implications for practice, education and research

While the basic idea of lean is to reduce cost and increase nursing quality, systematically, through quality improvement projects, simply adding tools and applying methods do not

guarantee long-term sustainability. Nurses must be empowered and motivated to adopt lean principles, which requires managers to instil, patiently and carefully, their teams with a deep respect for quality improvement and a culture of continuous inquiry. For successful lean implementation, applying change management principles is crucial to assess readiness for change among staff (Ducharme et al 2009).

Empowerment must emanate from the top of organisations. Front-line nurses and nurse managers require organisational support to carry out their jobs effectively. Higher level management must, therefore, devise strategies for securing resources, such as funds, personnel, technology and time, to create positive work environments (Patrick and Laschinger 2006).

Future nurses will require problem-solving skills to be competent and competitive in the current work climate. Academic institutions will, therefore, be urged to transform educational approaches and structures to enable students to gain a realistic approximation of contemporary nursing challenges. This includes integrating competencies for continuous improvement through innovative practices such as lean nursing.

Well-informed policy-makers will also be expected to redesign the healthcare system using evidence-based literature on models such as lean. This gives impetus to researchers to appraise critically the increasing collection of 'empirical' reports of lean practices in healthcare, and to systematically validate and monitor its applicability to the healthcare industry.

Conclusion

As health services are redirected from hospital settings to the community, EDs will be required to provide hyper-specialised and multidimensional nursing care. This will require nurses to adapt their practice so that they can adhere strictly to quality standards of healthcare delivery and financial stewardship. In this context, lean's potential as a framework for maintaining organisational viability, and improving operational efficiency and quality of care, is promising.

This article has given a brief analysis of lean philosophy and its relevance to EDs, and described the crucial role played by nurses in ensuring provision of high quality ED services within a culture of continuous improvement through lean. More importantly, it describes a philosophy that shows nursing as a value-creating profession in healthcare systems.

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