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Lean management in the health sector – illusion or delusion?

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Structured Abstract

Purpose: There has been considerable interest in implementing practices imported from manufacturing into healthcare as a solution to rising healthcare spending and disappointing patient safety indicators. One approach attracting particular interest is Lean management, which is explored in this article.

Design/methodology/approach: The exploratory research focuses on Lean management in the health sector. It is based on extensive secondary data and it is a practical in implication. Data provided both background and context.

Findings: Despite widespread enthusiasm about Lean management's potential, evidence about its contribution to higher performance is inconsistent.

Research limitations/implications: Major Lean operations management and human resource management concepts, including just-in-time (JIT), total quality management (TQM) and total productive maintenance (TPM) are explored.

Practical implications: This article contributes to the healthcare organizational management literature by showing that although Lean management seems to have the potential to improve organizational performance; it is far from a panacea for underperforming hospitals. The article informs policy-making by suggesting that a progressive managerial philosophy has a stronger impact on healthcare performance than adopting practices from any particular managerial approach.

Originality/value: A critical evaluation on Lean's impact on informing healthcare policy is presented, which contributes to healthcare organisational management literature by showing that even though Lean management in healthcare appears to have the potential to improve performance; there remain problems with its application.

Keywords: Lean management, Operational efficiency, Patient outcomes, Health-sector.

Article Classification: Viewpoint

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Introduction

Triple pressures - rapidly improving and more costly technology, an ageing population and severe recessionary pressures healthcare systems in the developed world mean that managers need to make long-term cost savings, while maintaining and enhancing service quality. The UK National Health Service (NHS) has the particular requirement for efficiency savings to enable reinvestment in quality that is estimated to be £21.1 billion by 2014 (Department of Health, 2010). This requires an 6% per annum increased productivity (Appleby, 2010), yet the UK Office of National Statistics estimates that productivity actually fell by approximately 0.3% per annum between 1995–2008 (ONS, 2010). Given these pressures, healthcare service productivity is salient. Consequently, Lean as a concept and Lean management as a managerialist practice is particularly pertinent and is explored with particular reference to the NHS. However, the NHS managerialist perspective is relevant to private sector management because it is seen as a third way of delivering healthcare by creating quasi competitive internal markets that promote private sector practice. Lean philosophy and practice have been implemented in the UK and international health sectors; promoted as an efficiency response as public spending increases. Despite widespread agreement about Lean's potential, evidence that it contributes to improved organizational performance is surprisingly limited; particularly important in the healthcare sector given the managerial pressures to alleviate soaring costs. There is, therefore, a need to critically review Lean's impact in organizational performance and in particular to inform healthcare policy.

Methodology

The method applied was built on a critical, systematic literature review, which exhaustively summarised the Lean literature relevant to health. The first step was a thorough search for relevant publications, which were assigned an objective methodological-quality assessment level using the Bandolier rating system. The researchers logged the search strings, which yielded more than 200 references. Additional terms were added to the string to focus the search. Next, titles and abstracts were checked against pre-determined eligibility criteria. To ensure that searches were consistent and comparable, we used keywords and phrases derived from the research topic, which were placed into categories and assigned keyword numbers to allow their strategic combination according to researcher impressions from the preliminary literature trawl:

1. Keyword 1 words were paired with every keyword 2 word once: Lean and healthcare respectively. The initial search returned 100+ references.
2. The search was refined by adding keyword 3 'outcomes' to the search string (Chambers and McIntosh, 2008).

Search logs were compared between researchers to ensure that the terms had been applied consistently (Saunders *et al.*, 2007). This research was refined to 100 articles, which directly addressed our topic. The critical review went beyond a simple analysis of the sources outlined. We considered each piece's relevance to our objectives, before asking if the research methods adopted in one source more usefully answered our question(s). This review highlighted the paradigms, gaps, contradictions and inconsistencies in the literature, within single works, before comparing the located article's authors' works. We then prepared a grid that revealed un-stated and invalid assumptions in arguments, distinguished: facts from hypotheses; facts from opinions; and an argument's conclusions from the statements that support it (Brown and

Keeley, 1997). We followed Cottrell's (2005) approach to assessing the quality of arguments and evidence, placing an emphasis on variety and validity on the materials under examination.

Lean processes

Lean encompasses several manufacturing approaches that included an emphasis on systems producing exactly what the customer wants at the lowest cost and with no waste. Lean's underlying assumption is that organisations are processes. Improvements made in a Lean context should optimise customer journeys rather than optimising individual departments. This perspective, which is widely applied in organisations, is referred to as the process-based view. Raab *et al.*, (2006) suggest that Leanness should be seen as an ideal to be pursued, not a system to be implemented. Thus Lean might include any good process/operations improvement that includes waste reduction, flow improvement and improved customer views.

Central to understanding Lean is understanding systems; often labeled systems thinking, which considers that changing one aspect (e.g., procurement) affects others (e.g., delivery). These interrelationships are often obscure and, therefore, any approach to improving systems should ensure that change produces desired effects. Lean thinking adds detail to a systems view by encouraging managerial interest in the way work and information flows, particularly where it runs freely and where there may be bottlenecks. This allows a focus on improvement efforts to those areas that improve the whole system and avoid sub-optimal changes.

Lean management or Lean enterprise is an umbrella term for several key practices, which aim at preserving value in business with less work. In one sense, it is efficiency, albeit based on flow optimization. Lean management was first proposed by Krafcik (1998), based on his experiences within Toyota. However, many Lean principles can be traced to Fordist production practices - a just-in-time (JIT) forerunner. In the post-war era, Japanese employees, adopting management theories and practices from the US and Europe, initially involved JIT processes. The Fordist mass production system, which had been adopted worldwide, built on product-specific machines operated by semi-skilled workers specialising in short-cycle operations to produce high volumes of standardized goods at low cost (Hinterhuber, 1994). Toyota and Honda managers adapted the American mass production system, arguing that it was neither practical nor economically sustainable (Emiliani, 2006).

Japanese production and competitiveness philosophies became a management practice benchmark. These principles and management practices are intrinsically linked to Lean production, Lean management, Lean thinking, Lean, Toyota production system (TPS) or flexible mass production. Lean management arguably highlighted mass production's limitations, arguing that increasing market turbulence, global competition and more sophisticated consumer tastes no longer allow companies to capture "market share and high profits by producing large volumes of a standardized product" (MacDuffie *et al.*, 1996, p.350). Lean's greater flexibility, underpinned by its ability to produce "many models in small numbers cheaply" (Ohno, 1988, p.1) was increasingly viewed as the solution to replace Fordism. Kaynak (2003) noted that Lean production required considerably less mass production and human resources, capital investment and manufacturing space, to produce the same volume in less time and with fewer defects. Fusing Lean with new technologies improved both control systems and organizational methods. Lean offers low cost and high-quality manufacturing, several models and functions, continuously improved

through rapid product development cycles. However, this promise has not transferred to the health sector.

Lean in the health sector

Codified Lean is an approach widely adapted to service and health organisations in the UK and abroad. The most successful adaptations seem to occur when employees manage the steps that produce value as a whole, rather than in bits or silos. This systems approach has organisational implications, not least productivity measurement at the system level rather than by unit, which focuses management effort on global rather than local efficiencies. Lean requires a culture that supports continuous improvement and consequent cost and headcount reductions. However, service characteristics are not an excuse for manufacturing methods to avoid efficiencies. West *et al.*, (2006) argues that employees can gain substantial benefits, including improved quality, reduced costs and increased responsiveness from at least some new practices. Supermarket staff adopted Lean techniques to improve customer flow for many years and there are strong benefits that can be gained from implementing Lean whatever the organization's size or sector (Swank, 2003). Although there are several enthusiastic contributions proposing guidelines for implementing quality practices, which document successfully implementing quality improvement measures in healthcare (Ovretveit, 2000), there is limited rigorous research assessing whether and by how much TQM in hospitals leads to higher performance. This is particularly the case for Europe. In the US, several studies examine TQM's impact on hospital performance; e.g., Douglas and Judge (2001) revealed that implementing seven TQM practices (management team involvement; adopting a quality philosophy; TQM-oriented training; customer focus; continuous improvement processes; management by fact; and TQM methods) in 229 hospitals had a significant positive financial impact.

By contrast, analysing data from 61 hospitals, Shortell *et al.*, (2005) reported implementing TQM philosophies and practices was not significantly linked to improved financial performance. Nonetheless, positive links to perceived patient outcomes, shorter stays and charges were found. Weiner *et al.*, (2006a) found mixed evidence about TQM's impact on performance using data from 1784 community hospitals. Alexander *et al.*, (2006) suggest that a positive link exists between implementation intensity, quality improvement practices and lower costs per case. However, contrary to expectations, quality improvement was found to be negatively associated with patient safety indicators, such as post-operative complications and failure to rescue (Weiner *et al.*, 2006a). They also found that involving hospital staff in quality improvement had a positive impact on clinical performance, although this is not always replicated throughout medical and nursing care (Weiner *et al.*, 2006b). There is little European evidence assessing the link between healthcare TQM implementation and performance. Kunst and Lemmink (2005) explored the link between quality management, customer satisfaction and business performance using the European Quality Award criteria among 227 hospitals in Spain, the Netherlands and UK. Their findings suggest a positive link between TQM and perceived service quality by patients. However, patients' quality perceptions, in relation to experience and TQM, are only modestly associated with performance, measured by occupation rate and financial results. Quality improvements are not defined solely as continuous quality improvement, TQM or other models, but rather as approaching healthcare change that focuses on assessing needs. For care providers, staff experience not delivery volumes or TQM outcomes, was more important in analyzing specific patient

groups. As patient satisfaction is considered a prime service-quality indicator, it is unsurprising that TQM was not consciously linked to patient experience or satisfaction, when it was linked directly to clinical care it became detached from health outcomes. Using measurement to understand variation in performance to improve healthcare design is common but can easily become obtuse and unclear.

The most significant Lean contributions, highlighting the link between participatory human resource management (HRM) practices and performance in healthcare, stem from American TQM literature. In particular, three studies by Gowen *et al.*, (2006a), emphasized leadership, empowerment and teamwork in enhancing hospital operational and financial performance. The first, using data from 200 hospitals shows that transformational leadership is an effective patient-safety chain catalyst (McFadden *et al.*, 2009). Their findings suggest that leadership based on charisma and inspiration at the highest organizational levels is associated with safety culture and adopting patient safety measures that are positively reflected in patient safety outcomes: e.g., reduced error-frequency, severity and impact, increased understanding and awareness. Gowen *et al.*, (2006b) explored strategic HRM's impact on performance above and beyond adopting continuous quality improvement practices. They interviewed 587 hospital quality and risk directors and found that implementing both HRM and quality practices improved performance. They noted quality management processes were more strongly associated with fewer errors and error reduction barriers, while strategic HRM practices (encompassing teamwork, extensive training, information sharing, rewards, recognition and promotion) more effectively achieved sustainable competitive advantages. These findings were corroborated by a second study among 372 US hospital managers (Gowen *et al.*, 2006c) showing that initiatives (information sharing, quality programme meetings, employee recognition, results sharing) and employee control initiatives (training, financial rewards, promotion opportunity) were more strongly associated with perceived quantitative dimensions (quality improvement, customer satisfaction increase, net cost savings, reduced error frequency and severity) and qualitative performance (understanding errors, heightened awareness, reduced impact) than implementing several healthcare quality practices, such as customer satisfaction, quality teams, statistical process control, benchmarking and supply chain management.

Kollberg and Dahlgard (2005) found a positive link between work- and healthcare-performance, noting that empowerment was positively associated with perceived productivity and self-rated effectiveness. Koberg *et al.*, (1999) also explored the correlation and consequences between perceived psychological empowerment among 612 healthcare professionals/managers; their findings suggest that empowerment perceptions were associated with job satisfaction, productivity/effectiveness and a lower propensity to leave. Harmon *et al.*, (2003), drawing on data from 146 US Veterans Health Administration centres, showed that high-involvement work systems (HIWS - encompass practices including performance-based rewards, empowerment and teamwork) were strongly associated with higher employee satisfaction and financial performance. Despite HIWS costs, health administration centre managers, implementing these practices, average \$1.2 million savings annually. McIntosh and Cookson (2012) emphasised that hospitals are not factories and hospital staff do not think of themselves as assembly-line workers, nor their patients as products under construction. There is a clash between efficiency and caring; doctors sceptical about the former and don't want to be told how to do things. In the UK, West *et al.*, (2006) studied acute hospital trusts showing positive

links between progressive HRM practices (e.g., performance appraisal, training, teamwork and employee participation) and lower mortality rates. De Souza (2009) transplanted TPS to hospital management. However, he could not determine whether and how TPS principles might apply to healthcare. Ballé and Régnier (2007) and Jimmerson *et al.*, (2005) describe single-site interventions aimed at reducing medical and medication errors, improving operating room turnover (Leslie *et al.*, 2006), reducing waiting lists (Hobson, 2007) and patient waiting times (Lodge and Bamford, 2008), streamlining clinical trial protocols (McJoynt *et al.*, 2009) and patient flows (King *et al.*, 2006).

It was not until 2005 that the first attempts to implement Lean in hospitals have been reported in the literature. There are, however, no Lean implementations across an entire hospital (Burgess *et al.*, 2009). Virginia Mason Medical Center in the USA, Flinders Hospital in Australia and the Royal Bolton NHS Foundation Trust in the UK are among the best known. Hospital staff retained value notions, patient focus and continuous improvement from TPS and implemented value stream mapping and rapid process improvement teams/workshops, which had a positive impact on operational and financial performance. Bohmer and Ferlins (2005) report how Virginia Mason Medical Center staff embraced TPS managerial principles to address financial losses and provider competition. Waste reduction and streamlined processes shortened staff walking time by 38%, distance by 77% and lead time into initiating and executing medical processes by 53%. Additionally, there was a 44% gain in productivity and savings between 12 and 15 million dollars between 2000 and 2002.

Ben-Tovim *et al.*, (2007) reported how Lean was applied at the Flinders Medical Centre in Australia to redesign the emergency department (ED) triage system. The new system was inspired by Toyota's manufacturing cells and divided patients in two groups: (i) likely to go home or (ii) admitted. The steps needed to complete the patient's journey through the hospital were mapped and streamlined to identify waste and simplify processes. The ED was redesigned and two production cells were created to focus on each patient group. During the first year, patients leaving without treatment was reduced from 7% to 3% and time they spent in the department was cut by 48 minutes. Casey *et al.*, (2009) noted in the US that Lean in ambulatory care settings facilitated waste identification and elimination. Flow time, inventory and throughput were used to improve patient movement through the clinic and to identify points that slow this process. Non-essential activities were shifted away from bottlenecks (e.g., physicians) and extra work capacity was generated from existing resources. They argued that additional work capacity facilitated a more efficient response to variability, which in turn saved money, generated more time for the physician to interact with patients, which completed patient visits more quickly. However, Lean, via JIT, eliminated excess clinic inventory, and synchronized with patient demand reduced costs, but the effect on care quality was not quantified. This captures the trade-off between cost and quality – the former is clearly identified while the latter is difficult to quantify.

In the UK, Bolton Hospitals NHS Trust is considered to be at the Lean implementation forefront. To address a spiraling financial deficit and problems with long waits for diagnostics and treatments, Bolton Hospital staff adopted a Lean philosophy, implementing rapid improvement events throughout (Fillingham, 2007). Multidisciplinary teams and patients focused on patient flow from arrival to discharge to identify waste, error sources and duplication. Their efforts resulted in significant operational and financial improvements; e.g., trauma service staff experienced a 42% reduction in paperwork, a 38% reduction in the time taken to get fractured-hip

patients into theatre, a 33% reduction in stay and a 36% reduction in mortality. In pathology, there was a 10% increase in income with 2% fewer staff, a 50% reduction in floor space and a reduction in the average time to process blood from five to one hour. Overall the research evaluating Lean's impact in healthcare, particularly the contributions that focus on strategic HRM and TPS practices, offer encouraging support for transplanting Lean practices from manufacturing. However, the evidence is limited and needs to be interpreted with caution:

1. While Lean's impact in industry is evaluated against mass production, there is not a universally accepted view in healthcare against which performance can be benchmarked. Given that better performing organisations are also likely to be innovative, it is unclear whether any improvements in performance result from the Lean's added value or from pre-existing differences in performance between organisations.
2. Most studies focusing on hospital TPS, report successful interventions that reduce waste and increase performance within specific units. This latter is critical because it limits generalising findings to the wider healthcare sector (Weiner *et al.*, 2006a). So generalising results across healthcare is limited.
3. These interventions seem to be promoted by change champions (Young and McClean, 2008), which raise doubts about their sustainability or ability to scale up to other healthcare areas. Hence, excepting progressive HRM practices, which the industry literature has also positively associated with performance, there is limited evidence that Lean is a panacea against rising public healthcare costs and patient safety issues.

Discussion

Lean proponents argue that healthcare can benefit from waste and cost reduction, increasing care quality, applying techniques to reduce turnaround time in critical services. However, applying Lean principles to healthcare has limitations. The primary difficulty is that large healthcare-providers are diverse organisations with complex demand and resource issues, exacerbated by technological developments and human perceptions. These complexities manifest themselves across several issues as diverse as timely provision to varying patient satisfaction. While service timeliness is relatively easily defined and accepted in manufacturing settings, delivery in the health sector is not always linear, but is dependent on complex supply factors. Timely service is diffuse and influenced by culture, expectations and perceptions that differ regionally and internationally. Cost factors, both financial and economic, create unique health sector demands, which are entirely disparate to those in the manufacturing sector (McIntosh, 2011). Lean management processes may not be applied universally to a system in which human perceptions mix with easily measurable input/output processes, and where cost and quality may not be directly connected or even understood. Quality is a perceived experience based principally on expectations rather than predictable outcomes: i.e., patient satisfaction is dependent on factors that negate many Lean aspects, which are different from manufacturing. The dilemma faced by managers is the trade-off between cost and quality – the former is clearly identified while the latter is difficult to quantify cogently (White, 2006). Healthcare is different from manufacturing; i.e., Lean cannot be easily replicated or transplanted.

Nonetheless, if Lean is to be grafted onto a healthcare provider then business process improvement methods (BPIMs) need introducing, which require a cultural

change unheralded in the NHS's history. Business process improvement methods are built on staff and management, autonomy unrestricted by political interference. Because the NHS is a highly politicized organization, a decentralized autonomous management structure would be problematic and politically sensitive. At this juncture, introducing BPIMs in manufacturing was an evolutionary process – likely to be the same for Lean in healthcare. Lean needs an overall strategy built on capable leadership, behaviour monitoring and stakeholder engagement. Without such underlying enablers, Lean becomes an illusion and its implementation a delusion. Ultimately it may not be possible to directly apply Lean to healthcare; i.e., it is not a single point invention, but the outcome of a dynamic value creating learning process. Lean management in manufacturing was a learning process; the same is true in the NHS. The challenges lie not in theory but as always, in application.

Value is sometimes difficult to specify in services because staff deliver important intangible benefits (e.g., trust) alongside the tangible benefits (improved health). The danger, in these circumstances, is that improvement efforts focus on the short-term, easily measured service aspects and neglect the intangible outcomes. It is necessary to balance short-term, value proxy-markers with estimating true service values, even if wholly qualitative, so that the whole system (i.e., the value stream) can be identified and improved (Sarkar, 2007)

A defining service characteristic is that the processes that deliver them can vary in time and standards. In manufacturing, task standardisation is used to overcome this, but much service variability comes from variable input; i.e., customers buying cars specify their demands with limited alternatives; customers needing health services, on the other hand, can make complex and variable demands on providers. In Lean services, this variability is narrowed by reducing the variability in performance between individual health professionals while relying on their flexibility, intelligence and judgment to work effectively (Jones and Mitchell, 2006). A common health-service feature is relatively high variation in patient demand by volume and service type. Some demand is likely to be generated by an earlier, unsatisfactory experience (i.e., failure to deliver services effectively). There is also likely to be missed demand because people give up trying to get through on busy telephones or lengthy service waiting times, or modify their demands because expectations are low or capability to help them is lacking. When demand is really understood, patterns can be identified that help staff respond and improve (Swank, 2003). Another variability emerges from the many units or compartments, inside and outside healthcare involved in service provision. This leads to many work handovers, potential error, delay, misunderstanding or variation. Owing to the organisations and people involved, and because these risks are well known, there are often many reviews and checks built into delivery systems. All these reviews and checks, in Lean terms; represent unnecessary work caused by poor design (Womack and Jones, 2005).

It is clear that healthcare is not directly or easily comparable to manufacturing. Healthcare is driven by expenditure, with resources dictating work volume. While Lean may be applied in some instances, fundamental differences emerge. Despite Lean's importance, it cannot be viewed as a panacea for all operational issues that plague healthcare, particularly in relation to implementation in large organizations.

Conclusion

This literature review on Lean in the health sector reveals mixed results. Whether this is due to the relatively small study samples, or because the way Lean has been implemented, cannot be determined here. The evidence in the current literature shows

neither overwhelming support towards Lean's acceptance, which can be applied to the health sector, nor its outright rejection. However, evidence suggests that related Lean concepts, tools and techniques could only be implemented piecemeal owing to the need for service processes to cope with a wider outputs and the accompanying uncertainty which is often the case in manufacturing. This may be due to the greater capital intensity required in manufacturing compared to the heavier labour intensity in healthcare.

Research evaluating Lean's impact on healthcare performance, particularly those contributions focusing on implementing strategic HRM and TPS, offers some encouraging support for importing them from manufacturing. But, the evidence remains limited and needs to be interpreted with caution. There are two primary reasons: first, while Lean's impact in industry is evaluated against mass production, there is no universally accepted view in healthcare against which any changes in performance can be benchmarked. Given that better performing organisations are also likely to be innovators, it is not clear whether any improvements in performance result from Lean's added value or from pre-existing differences in organisational performance. Second, most contributions, particularly those studies focusing on TPS implementation in hospitals, report successful interventions aiming to reduce waste and increase performance within specific units, which limits generalising findings to the healthcare sector (Weiner *et al.*, 2006b). These interventions seem to be promoted by change champions (Young and McClean, 2008), which raises some doubts about their sustainability. Hence, apart from progressive HRM practices, which the industry literature has also positively associated with performance, there is limited evidence that Lean is a panacea against the rising public healthcare costs and patient safety.

The literature does not support the position that Lean can be successfully adapted for extensive use in the health sector to achieve several strategic objectives. Some literature cautions against simply replicating existing manufacturing-based approaches in the health sector, suggesting that service organisations need to move away from Lean's restrictive rationale. This position contrasts with the enthusiasm with which some managers, management consultants and academics welcome Lean management. It may well be pertinent and relevant to implement reverse engineering research, looking at its application in the health sector and comparing it against a comparable manufacturing equivalent, if one exists.

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