

A novel conceptual approach to lean: value, psychological conditions for engagement with work and perceived organizational support in hospital care

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Abstract

Background: Lean thinking (LT) has emerged as a promising approach for reducing waste and improving efficiency. However, its applicability to and effectiveness within healthcare, particularly within hospital-based care, remains clouded by uncertainty. This paper attempts to answer the question ‘how lean thinking can best be applied to hospital-based care’.

Methods: Narrative review and conceptual synthesis

Results: We first review the principles of LT and how some of them are challenging to apply within hospital-based care. We then highlight that lean is an approach that was always meant as a combination of technical expertise and a focus on people—supported by a suite of human resource management supportive practices. We proceed to introduce evidence stemming from the literature studies on perceived organizational support and the psychological conditions for successful staff engagement with their work (namely, psychological meaningfulness, availability and safety as experienced by staff) and review how they may apply to hospital-based health workers. We finally advance a set of hypotheses regarding how different facets of value in a hospital care pathway may be correlated and these relationships mediated/moderated by perceived organizational support and the psychological conditions for engagement with work.

Conclusion: We conclude with a discussion of the limitations of our work and the aspiration that the conceptual analysis we have offered is a useful and actionable framework for hospital management to explore how best to support their staff—in a manner that ultimately achieves better quality and patient experience of care.

Key words: lean, perceived organizational support, psychological meaningfulness, human resource management, leadership

Introduction

Lean thinking (LT) emerged from a Japanese manufacturing practice, often known as the Toyota Production System [1]. LT considers ‘value’ from the perspective of the customer. Its objective is to reduce waste and non-value adding activities to create a high-quality, efficient system that enhances operational performance and, ultimately, organizational performance and competitive advantage for the business that applies it. To date, LT has been applied to a wide range of manufacturing but also service organizations, with literature showing that while many organizations can successfully implement LT, others fail to do so [3, 4].

LT has also been introduced in healthcare—in hospitals in particular. Within the healthcare industry overall, it is argued that the patient or service user should primarily define what creates value [5, 6]. Within this field, evidence of the impact of LT remains mixed [7]. On the one hand, some literature shows that LT offers significant improvement opportunities in hospitals [8, 9]. On the other hand, researchers argue that lean principles as they have originally emerged from

manufacturing do not translate well to healthcare systems [10, 11].

This paper focuses on the application of LT in hospitals and aims to address the question ‘how lean thinking can meaningfully be applied to hospital-based care’ [6]. We attempt to offer an innovative conceptual perspective to answer this question. We provide an analysis that, firstly, considers the main concepts of LT and barriers to their successful application within a hospital setting; and secondly blends together three concepts—for the first time, to the best of our knowledge: value (derived from LT), psychological conditions for staff engagement with their work and perceived organizational support.

Literature overview

Lean thinking within hospital-based healthcare

LT was introduced to healthcare in the last two decades from its origins in the manufacturing industry, where it has over six decades of presence. Literature to-date shows potential

benefits from applications of LT in healthcare, however these are often found to be inconsistent. Lean approaches have been critiqued as having unclear applicability and utility for the healthcare industry overall [12, 13].

The basis of LT as typically translated into Western countries from its Japanese origins in Toyota consists of five core principles [1]; identifying what customers consider of ‘value’, identifying ‘value streams’, smoothing ‘flow’, using ‘pull’ mechanisms and pursuit of ‘perfection’. These principles place operational value (OV) and process improvement at the centre of LT, which however causes tension when process improvement comes at the expense of working conditions of staff [10]. In addition, these principles do not take into account a key element of the Toyota Production System that generated LT, that is, value from the perspective of staff [27, 28]. Further, these principles may be well suited for a variety of (mass) manufacturing and service systems, but their direct applicability to healthcare, including hospital-based care, has been questioned [29].

We propose that there are several characteristics of hospital-based care to be taken into account when LT is applied:

Facility settings

The typical hospital setting comprises numerous different clinical pathways and facilities, including diagnostic and direct treatment facilities, labs and testing facilities, patient logistics, material logistics and warehouses and administrative facilities. The involvement of patients in these facilities range from direct presence in diagnostic and treatment facilities, to absence from warehouses and material logistics facilities. Successful provision of the diagnostic and treatment facilities forms the main mission of the hospital organization, which is supported by all other facilities of the hospital. Hospitals are required to serve large segments of population relative to their capacity, with high and partly unpredictable fluctuations of admission rates. This means that hospital processes tend to be characterized by high volume with high variety, which differs from both manufacturing but also service organizations, which mostly produce standardized products or services. Historically, LT has been more suited to mass production systems, characterized by high volume (of production or service provision) and low variety of products or services available, such as the Toyota Production System. Task/activity scheduling in hospitals can be a more complex process relative to manufacturing [30, 31]—we return to the aspect of scheduling work in hospital facilities in a later section.

Service quality

All parts of the hospital facilities can impact on quality, safety and satisfaction with care, directly or indirectly. Grönroos [32] considers the work of Swan and Combs [33] and describes the concept of service quality in the following two dimensions: a technical dimension (knowledge and skills) and a functional dimension (interaction between customer and service provider). In the hospital setting, the former refers to the interaction of patients with clinical staff during diagnosis and treatment, and the latter refers to interactions with the other facilities and services offered by the hospital. It has been argued that the imbalance of specialist knowledge between care provider and user may mean that a patient may not have specialist technical knowledge to fully evaluate the quality of

their treatment [34]. The main focus of a service user is on their recovery (and safety) resulting from the diagnosis and treatment that they receive, over their interactions with other hospital facilities and systems.

Value

Young and McClean [35, 36] stress the importance of defining ‘value’ for healthcare and propose the following three value themes: *operational value*, *clinical value* and *experiential value*. In manufacturing, OV reflects operational quality and efficiency and plays a major role in achieving LT objectives. This does not translate directly in hospital environments, where patients have different characteristics and health statuses and typically require a range of different pathways of treatments. Clinical value (CV) reflects clinical knowledge and skills, allows for correct diagnosis, selection of appropriate treatment pathways and achieving the best and safest outcomes for the patient. Experiential value (EV) as defined by Young and McClean [35] reflects value from the perspective of the patients, with a specific focus on the value they place on their experiences of care. Patients have the experience of their illness, but not necessarily the technical expertise to provide valid and reliable evaluations of clinical diagnosis, treatments and associated CV [34]. The interaction between patients and healthcare providers and the experience of safe care and recovery from illness are two facets of care delivery that allow patients to evaluate indirectly the CV. The ultimate successful treatment (CV) and also the wider experience of a hospital care episode (e.g. delays in diagnostic results becoming available; unnecessarily prolonged length of stay, i.e. aspects of OV) contribute to the patient’s evaluation of the services that they have received whilst in hospital, thus allowing patients to formulate the EV of their care episode. Lean approaches within hospital-based care have often aimed to address delays in care pathways—these offer a useful illustrating of the improvement complexities faced within this setting. A patient pathway in hospital comprises chains of interrelated activities, which should be performed in a timely sequence, i.e. they should be coordinated [35]. It follows that improving the operational flow of work/activities in a hospital is a complicated task, where improvement in one part of a pathway (e.g. reduced waiting time for a test result) may not be linked to improvement in the entire pathway a patient needs to go through (e.g. because there is still a bottleneck in how many patients can be treated by the number of hospital specialists within the available hospital facilities). Evidence shows that both waiting and consultation times are associated with overall patient satisfaction [37] and then EV. It is not always possible reduce waiting times by increasing resources such as increased staffing—but other improvements can be considered [38]. Fitter patients without comorbid conditions could be seen faster (e.g. their care following standard guidelines), whereas sicker patients, with multiple comorbid conditions, would benefit from longer consultations, so that physicians can spend adequate time to consider treatment options and maintain patient safety. Increased consultation time may thus add to both the CV and the EV in this scenario—and indeed even to the OV, as these patients are successfully treated earlier, without unplanned returns to hospital. A further example on how different aspects of value can be linked: Al-Hakim *et al.* [39] found that disruption caused by coordination failures between various segments of the surgical care pathway

contributed approximately 30% of the total pre-operative anaesthetic time. Reducing disruption would both improve surgical workflow (OV) and also reduce time a patient is unnecessarily under anaesthesia (EV), hence improving both OV and EV of care [39]. Further, disruption to perioperative surgical flow may comprise minor events, e.g. surgeon receives successive unrelated telephone calls. The accumulation of these events, however, creates stress and fatigue and may predispose the surgical team to error [40, 41], which ultimately affects both CV and EV. Reducing disruption during surgery is a useful example of the potential correlation between OV, CV and EV, which we examine in detail later.

Waste

LT classifies activities from a customer viewpoint into the following three themes: value-adding, non-value adding but supporting and non-value-adding (or wasteful) activities. ‘Value stream mapping’ techniques are used to stream the value and diagnose the non-value-adding activities, which are then considered for elimination (hence making the system leaner). The traditional techniques for reducing waste tend to focus on OV; here, we argue that there is an argument for an additional CV perspective in healthcare. For instance, numerous studies have found that hospital work environments are conducive to disruptions to staff work. Accumulation of disruptions increases workload [43], creates stress and fatigue and predisposes to error [41, 43]. There is therefore an argument that CV from the perspective of frontline staff can be a major focus in hospital applications of lean. This can be achieved through improving the work environment and reducing disruptive events, so that the workflow becomes more efficient, wasted time is reduced and, ultimately, waste is reduced. Accordingly, for healthcare, waste could be expanded conceptually to include any activity that does not contribute to CV, in addition to value as experienced by patients.

Pull principle

The pull principle assumes that the customer initiates (‘pulls’) the production. In a hospital facility, clinical decision-making based on a patient’s presenting complaints or symptoms triggers the workflow and hence the argument for embedding the pull principle in hospital settings. However, the patient waiting times and queues in hospitals (which are synonymous to work-in-progress in manufacturing) cannot be easily avoided because of the typically limited capacity of hospitals relative to population demands (emergency departments, as the hospital ‘front-door’ offer a good example of this challenge).

In light of these characteristics of the hospital setting, here we argue that criticisms that have been addressed towards LT may be driven, at least partly, by the manner in which LT has been used within the healthcare industry. While LT emphasizes a holistic view of the work system, healthcare applications often report narrower technical applications [12], neglect the unique characteristics of healthcare provision [14], concentrate mostly on operational aspects of care and give lower priority to the complex ‘sociotechnical’ aspects of a healthcare system [10]. Moraros *et al.* [15] conducted a systematic review and concluded that lean interventions have showed no significant association with increased patient satisfaction, had negative effects on costs and staff satisfaction and showed inconsistent benefits in patient flow and safety. Rees and Gauld [16] further suggested that we still understand very

little about how LT could be implemented successfully within healthcare. Unsurprisingly to the healthcare expert, the literature suggests that care delivery processes are not directly comparable to mass manufacturing and that LT should not be viewed as a panacea solution for all the operational challenges that typically plague healthcare [17, 18].

In the following section, we offer a brief overview of management and leadership literature that suggests that more nuanced approaches to LT implementation exist and can offer a broader aspect (i.e. not focused narrowly on lean as a ‘technique’) that might facilitate the application of LT.

Human Resource Management (HRM) practices to support lean thinking

Existing literature emphasises leadership and the role of HRM practices for the successful implementation of LT. Liker [19] specified 14 principles of LT and provided detailed description of desired leadership attributes and associated HRM practices. MacDuffie [20] found that HRM practices improve both performance and quality. Coetzee *et al.* [21] considered ‘respect of people’ as ‘half of the Toyota way’s foundation’ and emphasized that neglecting of human aspect of LT is often cited as the leading reason for LT failure. A range of barriers preventing the successful application of LT have been stressed in literature, many of which are directly associated with HRM practices—including a lack of top management supportive attitude and commitment, a lack of leadership skills, a lack of employee engagement, a lack of dedicated resources and poor communication [4, 22]. The salience of these barriers differs between organizations and, accordingly, the literature advises that every organization ‘need to find its own way to implement lean’ [22]. In addition, HRM quality practices have been extended to include team psychological safety and effective ways to deal with human errors [23, 24].

It has been argued that managers in lean organizations are ‘corporate, delegators and excellent motivators of people, whereas employees are the key drivers of organizational success’ [25]. In addition, the perception of the employees of the organizational support that they and their efforts to instigate and sustain improvement within their line/sector of work receive (i.e. the concept of perceived organizational support, POS) is driven by effective leadership and favourable HRM practices. For instance, Neves *et al.* [26] suggested that POS fully mediates the relationship between management communication and employees’ job performance. We return to the concept of POS and its link with LT applications in the section that follows.

In addition to these HRM practices, Kull *et al.* [44] stress that successful implementation of LT requires more than technical application of lean tools, such as value stream mapping. To be successful, introducing and adapting new work practices in line with a LT requires different forms of ‘fit’, including cultural and social fit [2]. We therefore argue that, further to the HRM perspective on lean, psychological conditions related to healthcare providers’ engagement with their daily work (and its improvement) arguably play a considerable role in successful implementation of LT in hospital-based healthcare provision. To date, this perspective on LT remains underexplored. We introduce these psychological conditions in the next section.

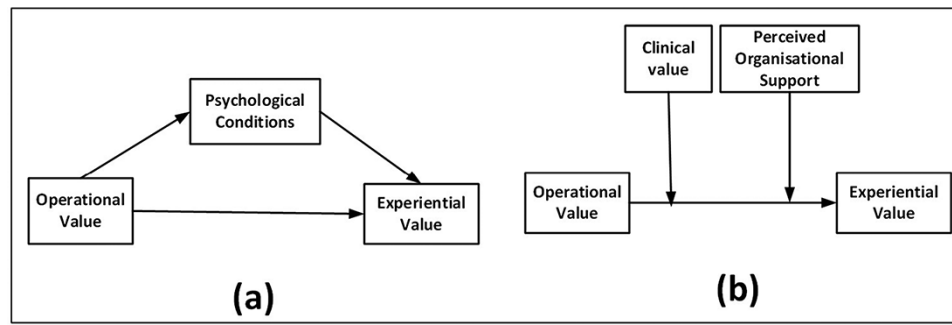


Figure 1 A novel conceptual model for lean approaches in healthcare settings. (a) The mediating effect of psychological conditions. (b) The moderating effects of clinical value and perceived organisational support.

Psychological conditions for engagement at work

According to Kahn's [45] ethnographic work, there are three psychological conditions affecting employees' engagement or disengagement with their work. These are psychological meaningfulness, psychological availability and psychological safety.

Meaningfulness at work is a state that relates to the positive feeling that work is worthwhile, important or meaningful [46]. Meaningfulness has been widely recognized in literature as a significant psychological state for employees' positive work-related outcomes [47]. *Psychological availability* is defined as the perception of an individual that s/he has the required physical and cognitive resources to engage in performing a task [45]. In healthcare, it reflects the readiness and confidence of physicians, nurses and other staff members to carry out the required diagnoses, tests and treatments [47]. Rich *et al.* [48] argue that confidence and self-consciousness form the primary influences on psychological availability. Lastly, *psychological safety* is defined as 'feeling able to show and employ one's self without fear of negative consequences to self-image, status, or career' [45].

Existing literature highlights positive correlations between the elements that constitute the psychological conditions, such that they tend to shift in the same direction [45, 47, 49]. Healthcare professionals craft their job in a meaningful way as being about healing society rather than sole delivery of 'technical' tasks, which contributes to their psychological availability even in the face of challenging circumstances, such as the current pandemic. Psychological safety enables the other two conditions further. In fact, we would argue that faced with a pandemic crisis, the perceptions of safety extend beyond psychological to (perhaps unusually under normal working routine) the physical safety of the healthcare providers.

Here, we put forward the argument that to achieve these three inter-related conditions which allow staff to engage positively with healthcare work and its ongoing improvement, POS is a necessary provision. POS is not an 'objective', external provision of material support by an employing organization to their staff [50]. POS is strongly driven by effective leadership and favourable HRM practices [51] and accordingly captures the staff's perception of the degree to which their employing organization values their contributions and cares about their well-being [52, 53]. Literature shows that POS has a positive effect on health professionals' job satisfaction, commitment and performance towards patients and self-esteem and negative direct effect on burnout [54–56].

In the following section we develop the conceptual argument of how POS, and the three psychological conditions we outlined are related to the ability of an organization to implement LT and increase value. In doing so, we aim to expand the current perspective on LT within hospital-based applications and to offer a set of hypotheses for further empirical testing through LT applications.

Concept development and hypotheses generation

In hospital-based care (and in fact in all healthcare), the working 'object' is the human body (or, arguably, the whole human person requiring care). The core focus of LT is on OV and the question we consider here is how an improvement of OV affects the EV a patient perceives. This question warrants a closer examination of the variables affecting the OV–EV relationship. Two types of variables can conceivably affect such a relationship: mediators and moderators. Investigation of mediating and moderating effects can thus provide a more precise description of the relationship between OV (which in many lean applications can be thought of as an 'predictor' variable, in the sense that improvements in it are expected to impact positively on EV) and EV (which following this reasoning can be thought of as the 'outcome' variable) [57]. On the one hand, a mediator is a variable that can best explain the effect of OV on EV. In other words, the mediator forms a route through which the independent variable influences the outcome. On the other hand, a moderator is a variable that specifies conditions under which a given independent variable such as OV is related to an outcome variable such as EV. The moderator may change the direction or magnitude (enhance or decrease) of the relationship. Graphically, these relationships are depicted in Figure 1a (mediating effects) and b (moderating effects).

Improving OV will likely have its bigger impact on efficiency, but the value of operational improvement from the patient's perspective depends upon the impact of the improvement on their experience with safety and quality of the care that they receive (i.e. the EV). On other words, EV correlates with the health providers' capabilities in terms of diagnosis, completion of care-related tasks and treatments, that is, of CV. It thus follows that the higher the CV can be, the higher the resultant EV will be. Accordingly, any OV improvement achieved within a hospital will ultimately not enhance patient experience if any such improvement impacts negatively on CV—as this will in turn reduce the EV too. This is a

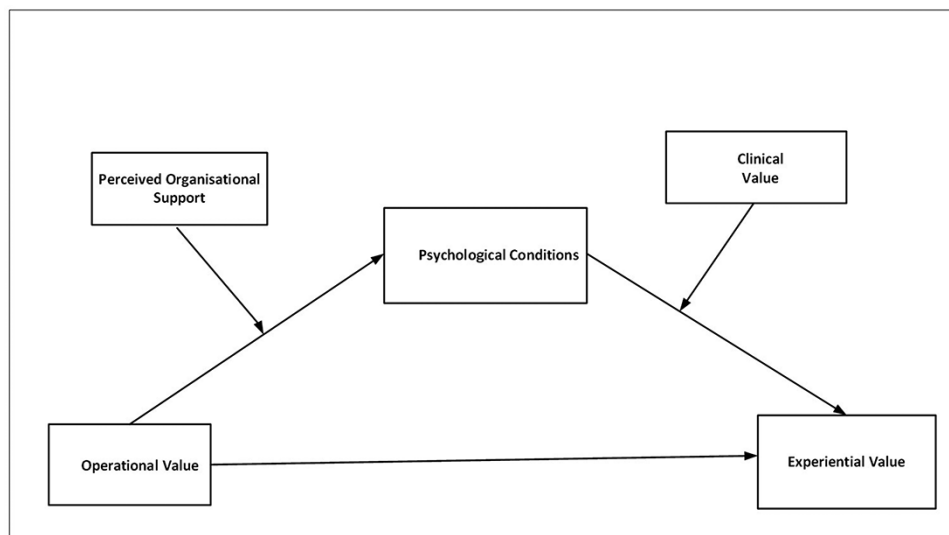


Figure 2 A proposed conceptual model of relationships between aspects of value as defined within lean approaches, perceived organizational support and psychological conditions.

consequential argument: it means that it is of utmost importance for any OV improvement to place substantial attention and focus on the effect of such improvement on the front-line staff's perspective—to achieve an improvement of CV. In other words, CV specifies a condition under which OV related to EV. Methodologically, this is the pattern in which CV moderates the OV–EV relationship (Figure 1b).

Moreover, we have earlier described that POS is driven by effective leadership and favourable HR practices. Literature emphasizes that POS has a moderator role and direct relation with task and contextual performance [51, 58]. Within the lean conceptualization, this essentially means that the healthcare providers' role performance (i.e. the CV) within a hospital cannot be separated from their perception of how much the organization values their contributions and cares about their well-being (i.e. their POS). It is expected that POS has a similar effect of CV on OV–EV relationship. It thus follows that POS is a further moderator of any effect of OV on EV (Figure 1b).

Furthermore, societies consider the job of healthcare professionals as valuable and critical to their wellbeing. Professionals have understood the value and meaningfulness of their job to the society. They frame their work as 'being about healing people' rather than sole delivery of technical care [59]. Having a highly meaningful professional role motivates health providers 'with a significant enough force to be counter-effective factor' to job difficult circumstances [60] and to build up positive professional identities in terms of psychological availability and safety [61, 62]. This in turn leads to the logical proposal that the effect of OV on the patient's EV can be explained through the staff's psychological conditions in terms of meaningfulness, availability and safety. Accordingly, these psychological conditions mediate the OV–EV relationship (Figure 1a). Our proposed relationship is analogous to literature that emphasizes the mediating role of psychological conditions between constructs related to engagement with work [47].

We now consider a further step—in which mediating and moderating effects are simultaneously present (Figure 2).

In combining both the mediating and moderating variables, the direct effect of OV on EV becomes not significant and the direct moderating effect of POS and CV on the OV–EV relationship will affect the two remaining relationships, that is, (OV–PC) and (PC–EV), which are parts of indirect effect path of OV on EV. The question arises whether each moderating variable controls one or both relationships of the indirect effect path. We would expect the answer to this question to differ depending on the organizational environment of a study. For instance, in a context where the hospital management comprehends and values the priority of CV and expected benefits from enhancing POS for their staff, we would expect the following to be observed:

- The hospital will make efforts to improve the skills and knowledge of their staff in order to enhance CV and subsequently EV.
- Improving CV and supporting staff will enhance POS.
- The staff's POS will, in turn, indirectly enhance EV.

In this scenario, POS forms a condition that affect directly the OV–PC relationship.

Further examination of the model proposed in Figure 2 suggests that improving CV would be expected to have a direct effect on more effective diagnosis and treatment of patients and therefore on patients' EV. Accordingly, CV moderates the PC–EV relationship. This would be observed in an organization that invests in staff training and development and supports effective care delivery processes.

Table 1 summarizes these relationships and conditions in the form of a set of conceptually driven hypotheses. These hypotheses will require empirical investigation to determine whether and to what extent they are supported.

Discussion and conclusion

We have offered a conceptual perspective on LT within hospital-based care, largely anchored at a reflective view of the lean framework as not simply 'technical' fixes to opera-

Table 1 Proposed hypotheses derived from the newly developed lean conceptualization for hospital-based settings

Variables	Figure depiction	Hypothesis	Relationship statement for included variables
OV, EV and PC	1a	H1	Operational value is positively correlated with experiential value and psychological conditions (i.e. psychological meaningfulness, availability and safety)
		H2	Psychological conditions (as above) mediate the relationship between operational value and experiential value
OV, EV and POS	1b	H3	Perceived organisational support is positively correlated with operational value and experiential value
		H4	Perceived organisational support moderates the relationship between operational value and experiential value
CV, OV, PC and POS	2	H5	Psychological conditions (as above) mediate the relationship between operational value and experiential value
		H6	Perceived organisational support moderates the relationships between operational value and psychological conditions (as above)
		H7	Clinical value moderates the relationships between psychological conditions and experiential value

OV = operational value; EV = experiential value; CV = clinical value; PC = psychological conditions; POS = perceived organisational support.

tional problems within hospital care pathways. To the best of our knowledge, the literature studies that we have brought together here are synthesized for the first time and offer a novel view of LT—or at the very least support a view of LT as much more than a technical toolkit.

Over the past two decades, LT has emerged as a promising approach for reducing waste and improving efficiency in hospital-based care, driven by the perception of value from the patient perspective. Several studies of healthcare lean applications and reviews of such applications have questioned the relevance of LT as applied [12, 13]. We have introduced the concepts of psychological conditions for meaningful work and POS within the LT framework and we have developed a set of conceptually coherent hypotheses based on combining these concepts with the concepts of ‘value’ within the lean framework.

Our work has limitations. Firstly, we set out to explore and advance conceptually how lean approaches might work (or not) within a hospital—we have not offered direct empirical confirmation of the proposed relationships. Secondly, there are potential other variables that could be considered relevant and added to such a conceptualization. Indeed some of the relationships we have described may be further determined by other variables too; in particular the EV that a patient derives from a hospital-based care episode is likely co-determined by variables related to their overall health and wellbeing, life circumstances outside health, their personality, mechanisms to cope with stress and their wider support network. Such variables were not included in our analyses nor could we include all that is known from improvement science and organizational studies of healthcare settings, hence our work cannot possibly be exhaustive. Finally, to achieve the conceptual development that we offer in this paper, we straddled several different literature studies. We included systematic evidence reviews, well-established frameworks and well-cited papers and books across these literature studies. Our approach offers a narrative, critical synthesis of evidence and not a systematic one—the latter would not be feasible or appropriate given our aims. We recognize this means that the evidence included in our conceptual development is not free from selection bias.

Our work also has strengths. Existing evidence suggests that within healthcare lean approaches seem to be used rather mechanistically—here, we offer a reflective conceptualization

that places the ‘human elements’ of care at the centre: we conceptualized both the value experienced by patients and also that added by staff. Further, the current pandemic has reinvigorated a focus on staff wellbeing and support on a global scale. By bringing POS and the psychological aspects of work firmly into the lean framework we believe we are offering a useful and actionable framework for colleagues to explore how best to support their staff—in a manner that ultimately achieves better quality and patient experience of care.

Further studies will provide the required empirical testing of the proposed relationships and produce data-driven refinements of the proposed hypotheses and the links between the concepts that we offer here.

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