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Abstract

Purpose: Healthcare organisations face significant productivity pressures and are undergoing major service transformation. This paper serves to disseminate findings from a Lean healthcare project using a NHS Single Point of Access environment as the case study. It demonstrates the relevance and extent that Lean can be applied to this type of healthcare service setting.

Design/methodology/approach: Action research was applied and Lean tools used to establish current state processes, identify wastes and develop service improvement opportunities based upon defined customer values.

Findings: The quality of referral information was found to be the root cause of a number of process wastes and causes of failure for the service. Understanding the relationship and the nature of interaction between the service's customer/supplier led to more effective and sustainable service improvement opportunities and the co-creation of value. It was also recognised that not all the Lean principles could be applied to this type of healthcare setting.

Practical implications: The study is useful to organisations using Lean to undertake service improvement activities. The paper outlines how extending the value stream beyond the organisation to include suppliers can lead to improved co-production and generation of service value.

Originality/value: The study contributes to service productivity research by demonstrating the relevance and limitations of Lean application in a new healthcare service setting. The case study demonstrates the practical challenges of implementing Lean in reciprocal service design models and adds validity to existing contextual models.

Key words: Lean, Healthcare, Service redesign, Co-production

Article classification: Case study

Introduction

With its association with human life, healthcare has one of the most important roles in society and requires significant investments and constant improvement. The Institute of Medicine (IOM) reported that the current healthcare system needs fundamental changes with respect to safety and quality problems (Institute of Medicine, 1999, 2001). For this reason, the need to improve the production of healthcare services with respect to the quality of service, patient safety and satisfaction, and the cost of care is now widely accepted (Institute of Medicine, 2007; Smith et al., 2009). Lean thinking and other improvement approaches have been increasingly adopted in order to achieve a significant change (Holden, 2011; Vest and Gamm, 2009). Over the last decade Lean has

been applied to the health service industry where it has been associated with increasing quality, safety and efficiency through improved clinical processes.

This paper presents a Lean in healthcare research project which uses a National Health Service (NHS) Single Point of Access (SPA) as the case study, to demonstrate the relevance and applicability of Lean in a new healthcare setting. Lean thinking was used to recognise process variations and identify root cause of complaints and waste. This subsequently allowed the formulation of a redesign strategy that would ensure the most relevant stakeholders would be involved to define customer values in order to drive service redesign activities.

Literature

Healthcare improvement strategies and approaches

Hoping to overcome the limitations of function-based organization, many healthcare organizations have adopted various improvement strategies and approaches (Young and McClean, 2008; Radnor and Boaden, 2008; Brandao de Souza, 2009). Quality improvement has been one such method used to achieve better patient outcomes, system performance and professional development (Batalden and Davidoff, 2007, p. 2). Quality improvement interventions include Total Quality Management (Joss and Kogan, 1995), continuous quality improvement (Shortell et al., 1998), business process reengineering (McNulty and Ferlie, 2002), clinical microsystems (Williams et al., 2009) and Lean thinking (Waring and Bishop, 2010). Moreover, there are a variety of tools and techniques used by healthcare organisations for the purposes of analysing problems, identifying gaps in performance in order to produce desired improvements. These tools include flow diagrams to understand processes; run charts and control charts to understand variation and measurement within these processes; and learning cycles (or "Plan Do Study Act" cycles) to carry out tests of potential improvement solutions (Batalden and Davidoff, 2007). There are a plethora of terminologies to describe the adoption and sustained use of innovative programmes in healthcare; however there are ambiguities in the use of these terms which can mean different things in different contexts (Buchanan et al., 2007a, b).

Whilst healthcare organisations have focussed on improving service quality and patient safety in the past, recent years has seen considerable effort to curb healthcare costs and simultaneously improve quality of services delivered to patients (Johnson 2010). This is particularly true for the UK National Health Service (NHS) which is faced with the challenge of making 4% in productivity savings (Naylor and Bell, 2010), meaning that the NHS will be required to do more whilst using the

same or similar level of resources, whilst maintaining or improving service quality. As such, the application of Lean in the NHS has never been more relevant.

Lean in healthcare

Typically associated with the automotive and manufacturing industry, the application of Lean in the latter has received much attention with many documented examples of when it has been successful in improving productivity (Young and McClean, 2009; Brandao de Souza, 2009). Over the last decade, the application of Lean has expanded to service industries – in particular, health care (Guthrie, 2006; Fillingham, 2007). Lean has been applied in healthcare organisations across the world from hospitals in the USA (Savary and Crawford-Mason, 2006), Australia (Bem-Tovim et al., 2007) and the UK (Jones and Mitchell, 2006, Fillingham, 2007), as well as in both the acute (Radnor et al. 2006; Joosten et al. 2009) and community settings (Grove et al. 2010a, b). Its application has been associated with improving clinical processes for the benefit of patients by increasing quality, safety and efficiency (Fillingham, 2007; Silvester et al., 2004; Radnor and Boaden, 2008; Breyfogle and Salveker, 2004).

Holden's (2011) review of Lean applications in Accident and Emergency departments have shown that Lean can contribute to decreases in waiting times, length of stay, and the proportion of patients leaving without being seen. Lummus et al. (2006) and Kelly et al. (2007) used Lean tools in a physician's clinic and Emergency Department respectively to significantly improve patient flow and administrative processes. After two-and-a-half years of Lean implementation, the Flinders Medical Centre achieved a work increase of 15-20 per cent with fewer safety incidents on the same budget, using the same infrastructure, staff and technology (Gubb, 2009). Other research gave evidence of reduced lead-time (Al-Araidah et al., 2010), reduced clinical errors (Raab et al., 2006), process redesign (Van Lent et al., 2009) and enhanced patient and staff satisfaction (Dickson et al., 2009). In addition to this, Lean approaches have produced other measurable improvements such as improved patient flow in an emergency intake process and the discharge of cancer patients from inpatient to ambulatory services at the University of Pittsburgh Medical Center (Martin et al., 2009). Another example is the Virginia Mason Medical Centre in Seattle, which was able to achieve significant cost savings by creating additional capacity through waste reduction to eliminate the need to purchase multi-million dollar additional facilities (Womack et al., 2005).

As can be seen, the majority of the examples in the extant literature focuses on Lean application in physical health service settings and also a preference towards using Lean to improve patient flow in

departments with clearly defined processes. Furthermore, there appears to be little evidence on how Lean has impacted on other service quality dimensions such as 'accessibility'.

Improving access to healthcare

Accessibility to healthcare is perceived to be an important service quality dimension (Eriksson et al., 2011; Institute of Medicine, 2001), which has resulted in the creation and establishment of numerous Single Point of Access (SPA) in the healthcare sector. There is little academic literature which examines whether these SPAs have been effective in improving access but sources from the grey literature appear supportive and advocate their use. Partnership for Access to Health (PATH, 2009) report that SPA are one of the key themes of good practice that would improve access for patients with multiple and complex needs. Goodard (2008) describe how research carried out by Greater London Authority (2007), found that a major barrier faced by GPs and other referrers in directing patients to local mental health services was lack of knowledge of what was available and perception that mental health conditions were too specialised and complex to be dealt with in primary care (Goodard, 2008). As such, a SPA staffed by individuals with a specialist clinical knowledge in their respective field and full information about the range of local health service provisions was a key recommendation from the report. In recent years, there is growing consensus that 'front-loading' the patient pathway with expert staff would maximise the likelihood of patients being directed to the most suitable care pathway, and ultimately lead to faster access to the right care and reduce the need for multiple assessments (Naylor and Bell, 2010).

Despite the support for SPAs there were concerns from referrers, specifically GPs using a mental health SPA, who felt that the SPA was a boundary that 'impeded the establishment of professional relationships and transfer of knowledge', and reduced their accountability to their patients (Raine et al, 2005). Nevertheless, the study did acknowledge that the concept of SPA would eliminate a number of process inefficiencies (eliminate multiple forms and client records, reduce number of access points), and other literature described other benefits such as; i) better response times for assessment and treatment; ii) eliminate referral and assessment duplications; iii) standardise information and work processes; and iv) increased service quality and efficiency (Department of Health, 2010; Gallimore et al., 2009).

The literature has revealed that Lean application within a mental health service environment was lacking with only two papers identified (LaGanga, 2011 ; Radnor, 2011). Furthermore, the biasness towards case studies using departments with clearly defined process flows such as surgical,

laboratory and Accident and Emergency (A&E) settings, would suggest a need to explore the application of Lean in a new healthcare setting such as SPA; a clinical decision-making service function with ambiguous processes, which could provide evidence of Lean implementation and performance within a new context.

Background and purpose

Case Study

The study focuses on the Single Point of Access (SPA) function for a NHS Trust that provides secondary mental health services in the North of England, of which four exists. The organisation had undergone significant growth and structural changes resulting in the creation of four Business Delivery Units (BDUs). These BDUs were responsible for the delivery of mental health services for the population within their respective geographical area and were allowed a degree of autonomy in the way they delivered their services. However, this autonomy led to differences between the BDUs in terms of their operational processes as well as their service offerings. In response to the financial challenges faced by the Trust and to address the variations between the BDUs, the Trust embarked on a large scale service Transformation programme, commissioning a series of Service Reviews to identify and eliminate inefficient work processes through the use of Lean thinking.

The Trust recognised there were significant differences in the operational structure, resources, capabilities and capacity within its four SPAs which led to perceptions of inconsistent levels of service quality and performance. The SPAs were a relatively new function having only been established and operating for 18-24 months prior to the start of the study. Within the Trust, there was anecdotal evidence that the SPAs were not functioning well and were not supporting downstream service team but there was lack of understanding of the extent of this. Furthermore, with access to health services being a prominent quality dimension for the Trust and combined with the gap in the literature, the rationale and the impetus for the study was clear.

Based on the findings from the extant literature the following Research Question (RQ) was developed:

RQ: To what extent can access to secondary mental health services be improved using Lean thinking?

Method

The study followed an action research methodology such as that used by Zhang et al. (2012), Bamford and Chatziaslan (2009), and Bamford et al. (2009) in their studies of operations management within the NHS. One of the authors was embedded in the Trust for a one year period as a Strategic Improvement Project Manager within the Trust's in-house Service Improvement and Development Team. The researcher was tasked with carrying out a service review of the SPA teams which formed part of the organisation's wider Service Transformation Programme. Academic partners were also closely involved to provide supervision and professional guidance. With the researcher embedded within the Trust the research team had full access to data and personnel across the organisation. This allowed for the collection of relevant and high quality data during the research period.

The frontline SPA workforce were engaged in Lean thinking through facilitated workshops which had multiple purposes; 1) disseminate Lean thinking within the organisation, 2) information gathering to establish the current state at each SPA site and identify operational issues, and 3) serve as an in-house forum for knowledge exchange and internal benchmarking. The rationale for engaging with frontline staff being that these individuals had the relevant background and/or experiences to provide the appropriate data required to establish the current state (Jankowicz, 2005). As part of establishing the current state and incumbent operating model at each SPA site, Lean tools and techniques such as SIPOC, Value Stream Mapping, SWOT and PESTLE analysis were used to elicit and capture data from the frontline workforce. The validity of the Value Stream Maps were reinforced with Gemba walk throughs at each SPA site, as well as providing an additional opportunity to engage with the workforce and strengthen buy-in.

As is typical of Lean interventions, a holistic approach was adopted which led to the researchers engaging with other stakeholders such as the receiving service teams and referrers to explore their perceptions and experiences with SPA. Data was obtained through a mixture of interviews, questionnaires surveys, secondary quantitative data (obtained from the Trust's in-house performance and information function) and observation. This was followed by Root Cause Analysis to explore the source of operational problems and the stakeholder complaints. The extant literature provided evidence that researchers in Lean healthcare incorporated a mixture of quantitative and qualitative components in their studies (Herring, 2009; Wojtys et al., 2009; Radnor, 2011; Schwarz et al., 2011; Esain et al., 2012; Morrow et al., 2012), which reinforced the appropriateness of this approach.

Findings

The application of Lean thinking within the case study allowed the researcher to establish the current state operational processes within each of the SPA teams and identify waste and operational issues. The main complaints from referrers and service teams were associated with patients being signposted to the wrong service team for treatment.

Tracing root causes

The incumbent procedure for making a referral was through the use a paper based referral form for non- urgent cases and telephone for urgent cases. However, due to the breadth of mental health conditions and the qualitative nature of information needed by the SPA Clinician for triage, a 5 pages referral form was used to capture information that covered all possible permutations of mental health conditions.

In-house performance data indicated that on average, 70% of referrals received by SPA originated from General Practitioners (GPs), who comprised the majority of referrers. SPA teams were unclear on the reasons why GPs were not consistently completing the referral form so the researcher extended the Root Cause Analysis beyond the boundary of the Trust and engaged with GPs. It revealed that the SPA Clinician's ability to triage and signpost referrals accurately was dependent on the quality and completeness of the referral information supplied by referrers. This relationship is shown in the Linkage Diagram (Figure 1) that was generated as part of the Root Cause Analysis. Furthermore, analysis of a linkage diagram revealed that the supply of poor quality referral information also caused several other process wastes to arise. These included duplication from checking the quality of referral information, waiting for additional referral information and defect caused by SPA inaccurately signposting referrals.

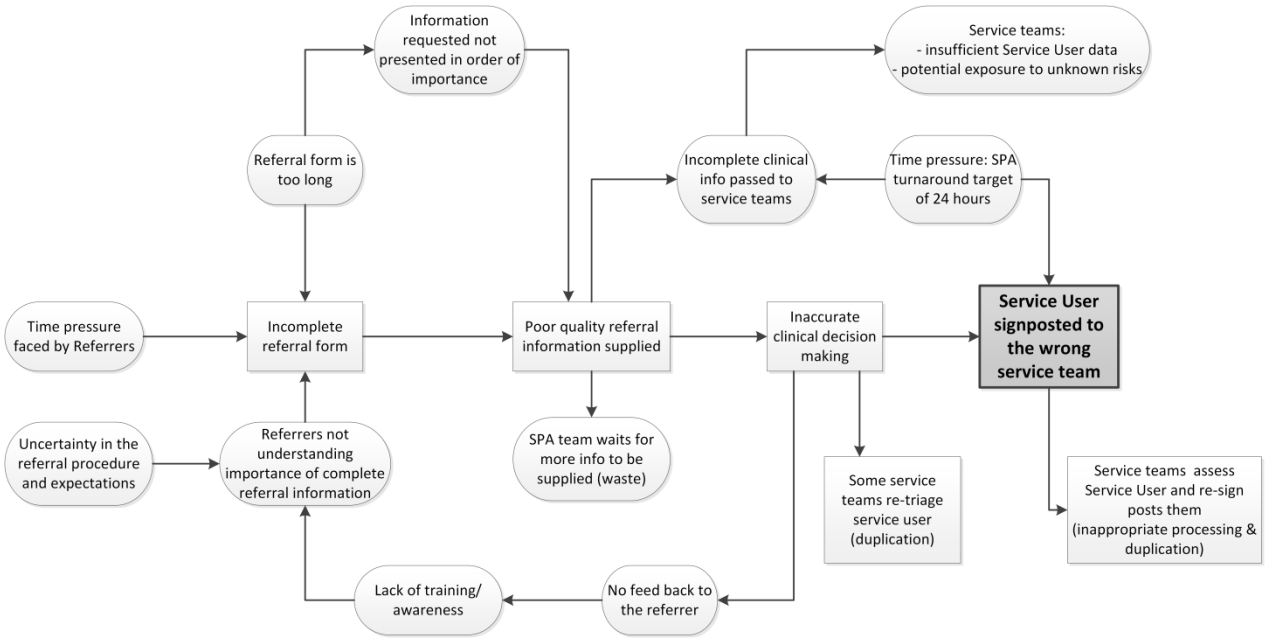

Figure 1: Linkage diagram to show the root cause of service users being signposted to the wrong service team by SPA

Defining customer values

The researcher engaged with GPs through direct semi-structured interviews and electronic questionnaire to enquire on their experiences on making a referral into SPA; what they did not like and their preference for supplying referral information. Their responses were analysed thematically and the results shown in Table 1 as the 'Demanded Quality' items. In terms of why sufficient referral information was not being supplied, GPs regarded the referral form as being too long and repetitive which often asked for 'demographics which is already on System 1 [Information technology (IT) System used by GPs]' and 'some of the boxes aren't applicable to the patient but if I don't fill it in the referral gets rejected'. Limited time was another reason given, with one GP explaining, 'We spend 10 minutes with a patient and then we have to write up the session […] a 5 page referral on top of that doesn't help', and another stating, 'it takes me half an hour to fill in the form – it's too long'. Overall, many of their complaints and SPA's process wastes stemmed from this interface between SPA and the referrer, i.e. the supply of patient and clinical information. Resolving this was essential to improving service quality.

Demanded Quality- 'Whats'		Quality Characteristics- 'Hows'
Multiple and easier options to make a referral	→	Broaden scope of referral format
Request more specific referral data (less information)	→	Reduce data requirements needed to make a referral
Access to professionals for case discussion if necessary	→	Improve clinical communication methods
Send communications and information electronically	→	Increase IT communications and improve information sharing
Clear service entry criteria	→	Clearly define processes and expectations
Feedback when a referral is unsuitable	→	Increase scope of information in the outcomes letter

Table 1: Demanded Quality items defined by GP values and corresponding Quality Characteristics

Developing improvement solutions

By using the Quality items defined by SPA's main customer (the GPs), and taking into account the outcome of the root cause analysis, the researcher was able to triangulate and focus service redesign engagement efforts that would create maximum impact. These results were presented to the SPA teams to engage them to develop improvement solution. A House of Quality framework was used to facilitate the SPA teams to develop solutions focussed on addressing the demanded quality items as specified by the GPs. From these Demanded Quality items, corresponding Quality Characteristics were derived (as shown in Table 1) to inform the House of Quality framework from which several improvement solutions were developed and scored depending on how well they satisfied the GP's quality values. The results are shown in Table 2.

Subsequently, a preferred improvement solution was identified to be a telephone based referral system that would allow the SPA Clinician to instantaneously pull relevant referral information directly from the referrer, and improve the accuracy of their clinical decision making. Several other customer values would also be satisfied, as well as eliminating or reducing process wastes such as:

- waiting for additional referral information
- duplication from SPA clinicians having to check completeness of referral information
- reducing defects arising from inadequate referral information being supplied
- referrers will have direct access to expert clinicians for discussions thus reducing waiting/delays to submitting referrals
- reduce the number of unsuitable referrals as referrers become more educated on what makes an appropriate referral through more effective knowledge transfer

Option	Redesign description	HoQ Score	Ranking
1	Do nothing but roll out RiO document scanning (as planned by SWYPFT)	30	5
2	Referral form submitted via email	44	4
3	Online referral form integrated into RiO	48	3
4	Routine & Crisis referrals taken by telephone	60	2
5	**Combination: Telephone & electronic**	**61**	**1**

Table 2: SPA improvement solutions derived from GP customer values

Discussion

Although the study identified operational process variations and used Lean thinking to mitigate these, it was noted that there were already many examples of the methods on how to reduce process variations in healthcare services and associated benefits in the extant literature. Discussions will therefore focus on how customer values were defined to influence the creation of service improvement options.

Shared clinical values can be derived when there are multiple customers

Much of the extant literature has stressed the importance of identifying the right customer to define values, with Womack and Jones (1996), describing failure to do so would result in the wrong product or service being delivered in a highly efficient way. However, in healthcare the environment is complex and there can be multiple 'customers' (Young et al., 2004; Burgess and Radnor, 2013) so identifying the customer and therefore defining values can be difficult. Nevertheless, The 10 year NHS Plan outlined by the Department of Health (2000) emphasised placing the patient at the centre of care and so value should stem from them. Young and McClean (2008) describe three types of value that exist in healthcare. In this study, the values which were identified can be considered 'Clinical Values' - focussed on achieving the best outcome for the patient; signposting them to the right service team for treatment. Despite not specifying the patient as the customer, these Clinical Values are likely to be shared by both clinicians and the patients. Therefore, when the customer is not clear, common values shared by the multiple customers can be used to guide Lean application.

Understanding the type of variability can prioritise improvement efforts

The root cause for patients being signposted to the wrong service team was traced back to the way referral information was supplied to SPA. Variations were identified within the SPA operational process which could be described as natural and artificial variations (Joosten et al, 2009):

- Natural variability arising from the needs of patients are unique which means each referral information will also be unique
- Artificial variability arising from inconsistent quality of referral information GPs input on the referral form.

With the procedure for making referrals centred around a referral form, the variations in the quality of the referral information can be considered an 'Artificial' variation as described by Joosten et al (2009), because the inconsistency was a result of the way the system has been described. Artificial variations can have a greater impact on health outcomes than natural ones (McManus et al., 2003; Joosten et al., 2009), and this is reinforced by the fact that inaccurate SPA signposting of patients has led to increased time patients have to wait for the correct treatment. Ultimately, ensuring the patient is signposted to the right service team first time would be dependent on the quality and completeness of referral information.

Understanding value creation can inform service redesign strategies

The root cause analysis led the researcher to investigate the interaction between the GPs and SPA. In doing so it was realised that the GPs were actively involved in the service production process – they supplied SPA with information, and in order to do so they are required to interact with the service provider. These observations appear to have parallels with Larsson and Bowen's (1989) matrix of service interdependence as illustrated in Figure 2.

In the context of this model, GPs are considered the customers who carry out a high degree of participation because they supply SPA (the service) with something needed by the service to allow them to add value, i.e. use the referral information to inform their clinical decision making to signpost the patient to the most appropriate treatment team. The high diversity of demand from the customer would correspond to high degrees of variations described earlier; implying that SPA service improvement should involve direct engagement and involvement of the customer, GPs.

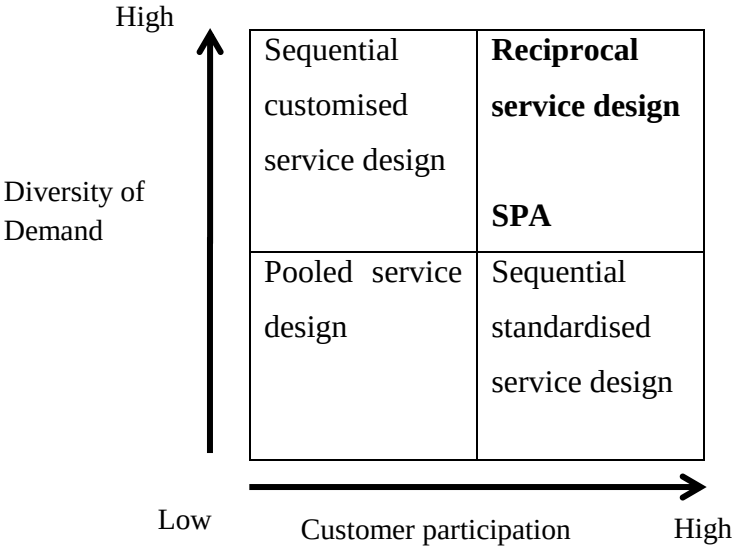

Figure 2: Typology of service interdependence patterns. Adapted from Larsson and Bowen (1989)

The reciprocal service production can also be considered as a form of value 'co-production' as described by Grönroos and Voima (2011). The GP and SPA interface can be defined as a Joint Sphere where the value is created through direct interaction whereby both the customer's and service's resources (time, personnel, knowledge, technology, etc) are engaged in a merged dialogue process; the GP and SPA Clinician create value through the exchange of referral information and clinical expertise in order to signpost the patient to the most appropriate mental health service team for treatment. Subsequently, the SPA service improvement efforts focussed on improving the interface between SPA Clinician and the GPs and the way referral information was supplied. In doing so, it was expected wastes such as waiting for additional information, incorrect signposting would be eliminated.

Application of Lean principles in healthcare services can be limited

Building upon Larsson and Bowen's (1989) work, Carlborg et al (2013) examined how different levels of customer participation in the production of service can impact on the application of Lean and these are summarised in Table 3. The outcomes of this case study reflected several of Carlborg et al (2013) observation of Lean application for Reciprocal Services. For example, Carlborg et al (2013) surmised that the application of Womack and Jones' (1996) Lean principles in reciprocal services would generally improve both efficiency and customer satisfaction, with the exception of the implementation of Flow and Standardisation which would see efficiency increase but at the expense of customer satisfaction. In the context of the case study, the high degree of GPs participation to create the service (providing referral information) and the inherent risk of input

uncertainty (each referral is unique and quality of information can be diverse) makes flow difficult to achieve. The SPA clinical decision making is customised to assess each individual referral which in itself is unique, and it is this activity which is coveted by GPs. As such, it would not make sense to standardise as the needs of each patient are different. However, the service could benefit through optimisation instead and subsequently the improvement propositions aimed to do this, such as increased and better use of IT and electronic communication. Indeed the improvement solutions developed by the SPA teams sought to manage and minimise the impact of variability of the quality of referral information supplied to them, and recognising the need to 'coproduce' value with referrers.

Therefore, understanding the context of value creation and the type of variations within operating systems can facilitate healthcare organisations to understand the limitations of Lean implementation within their services. Furthermore, it would as allow them to adapt their approach to service improvement to ensure that the right stakeholders were involved in service redesign.

	Define value	Define value stream	Flow	Pull	Standardise	Perfection
Pooled service design	√√	√√	√√	√√	√√	√√
Sequential standardised service design	√√	√√	√x	√√	√√	√√
Sequential customised service design	√√	√√	√x	√√	√x	√√
Reciprocal service design	√√	√√	√x	√√	√x	√√

Note: √√ Increase efficiency and customer satisfaction; √x Increases efficiency at the expense of customer satisfaction

Table 3: Lean principles in services. Adapted from Carlborg et al (2013)

Conclusion

The study has demonstrated that by using Lean thinking, healthcare services use various Lean tools and techniques to establish current state operational processes, identify variations and wastes. A series of improvement ideas were generated which focused on managing and reducing natural process variations by improving information flow between primary and secondary care clinicians. The greater availability of information would subsequently improve the clinical decision making

process of the SPA clinician. If the improvements were implemented, it was anticipated that accuracy of signposting patients to the most suitable service team would increase, which will reduce delays to treatment and duplicate assessments from occurring and eliminate a number of process wastes. Furthermore, relationships between GPs and SPA clinicians would benefit through greater knowledge transfer between health care organisations.

By analysing the context of value creation and process variations within the SPA setting the researchers demonstrated how healthcare organisations could tailor their service redesign strategy to ensure engage with relevant individuals to maximise value creation and improvement impact. The study also applied Carlborg et al's (2013) service design frameworks to explain why some of the Lean principles were not suitable for application in the SPA setting. Furthermore, the case study contributes to the knowledge base by serving as a practical example of a reciprocal service function and provides evidence of the relevance of the Larsson and Bowen's (1989) framework within a healthcare service setting. In terms of future research focus, the implications for System 1 within a lean environment will make for an interesting development of the central argument of this paper.

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