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An integrative approach to improving patient care pathways

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Structured Abstract:

Purpose: Globally, healthcare managers continue to struggle with managing increasing demands for their services with limited or shrinking resources. It is therefore, clear that systems, processes and practices need to change to meet these challenges. We assess how integrating two improvement technologies, Lean and Integrated Care Pathways (ICPs) might help.

Design/methodology/approach: Lean in healthcare and ICP provide a platform to develop conceptual frameworks for integrating two approaches.

Findings: A conceptual integrated framework is provided to assist care pathway designers and implementers to consider the synergistic benefits of combining approaches to improvement.

Research limitations/implications: We provide a conceptual framework that requires empirically testing.

Practical implications: This research provides a conceptual framework to aid practitioners to improve healthcare design and delivery.

Originality/value: For the first time, we bring together two approaches to improving patient care pathway design and considers how these are linked in relation to improving the delivery of health care.

Keywords: Lean, healthcare, care pathways, improvement

Article Classification: Conceptual

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Introduction

Globally, healthcare managers continue to struggle with managing increasing demands for their services with limited or shrinking resources. It is therefore clear systems, processes and practices need to change to meet these challenges (Burgess and Radnor, 2012). For some time, we have seen improvement technologies that have originated and matured in other sectors being used to improve healthcare. Although we have seen some positive results, some managers continue to struggle to make and/or sustain improvements. As we see the growing trend of patients coping with complex and multiple conditions, there is a need for a more integrated approach to improvement and technologies. Currently, it is unclear how different technologies can be aligned to ensure that improvement efforts are maximised and sub-optimising the healthcare system parts is avoided.

Since 2001 in the UK and 2002 in the USA (Radnor and Osborne, 2013) Lean has become a prominent approach to reforming healthcare (Burgess and Radnor, 2012). However, Lean

implementation has been variable (Radnor *et al.*, 2012) and it is sometimes difficult to elicit what works, why it works and when it works (Portela *et al.*, 2015). Typically, Lean has been embraced as a 'one-size-fits-all' solution and rarely considered how to integrate technologies used to improve healthcare.

Lean is the foundation for many large-scale improvement programmes in UK and elsewhere. For example, Productive Ward uses some tools and techniques you would expect to see in industry for example the Well Organised Ward module uses 5S and workplace organisation techniques, knowing how we are doing and the Patient Status at a Glance modules focus on visual management, measurement and data use (Morrow *et al.*, 2012). Despite Lean improvement programmes providing positive results, many still question whether they deliver the desired excellence in patient care. Healthcare professionals need to be able to assess when and where Lean can be employed.

Integrated Care Pathway (ICP) is another improvement technology that has been used to improve the flow of patients within the healthcare system. They focus on mapping the patient journey to enable the right people to do the right things, in the right order, at the right time, in the right place, with the right outcome. The ICPs are an interesting technology, as they are based on standardisation by identifying all necessary care trajectory elements. Variance permits scope for professional judgement (Allen *et al.*, 2009). However, research on the pathway development process indicate agreeing pathway content is not straightforward. Anecdotally there are pathways that are overly long and never used in practice (Allen *et al.*, 2009).

Our focus is to explore how Lean and ICPs can be integrated to provide better outcomes for patients and staff. Both are now well-established improvement technologies in healthcare (e.g. Brandao de Souza, 2009; Burgess and Radnor, 2013; Allen *et al.*, 2009) but until now, have been considered independently. Our aim is to address this gap and explore the synergies and how these two important improvement technologies could be combined. We provide a conceptual framework illustrating how Lean and ICPs can be integrated. Providing a better understanding how the two improvement technologies will undoubtedly assist those charged with designing improvement interventions and the need to articulate the programme theory associated with improvement technologies (Davidoff *et al.*, 2015).

Quality improvement and healthcare

Quality improvement (QI) in healthcare can be described as better meeting customer needs (Shortell *et al.*, 1998) by focusing on work processes and systems. Berwick (1989) states real change can only be achieved by system change. Quality improvement has been widely adopted in healthcare, particularly by hospital staff (Brennan *et al.*, 2009). An early QI healthcare literature review found that success determinants included clinician participation, feedback to individual clinicians and a supporting organisation culture. The determinants that led to failure were described as topics/areas chosen (e.g., heart failure, Chronic Obstructive Pulmonary Disease and depression led to many implementation problems), disagreement with national guidelines on best practice and vague feedback (Shortell *et al.*, 1998). Failure determinants are mainly related to the infrastructure required to support QI rather than the approach itself (Grol *et al.*, 2013).

More recently, other terms have emerged under the QI umbrella. Most notably improvement and implementation science have been popularised within the QI healthcare literature. Both are driven to develop an evidence-based QI approach. To stand up against the randomised control trial (RCT), there is a need to provide stronger theoretical and methodological foundations. A better and more informed theory use can strengthen the improvement programme design, implementation and evaluation (Davidoff *et al.*, 2015; Dixon-Woods and Martin, 2017), which includes a better programme theory understanding and explanation (e.g., a detailed

improvement programme). Often more than one QI approach may be employed, as healthcare managers, like other industries, have seen several approaches deployed; e.g., Lean, six sigma, Lean-six sigma and constraints theory. What is lacking is the programme theory and how these approaches are integrated to provide better outcomes.

Lean in healthcare

Since 2001 in the UK and 2002 in the USA (Radnor and Osborne, 2013) Lean is one improvement methods that has become a prominent approach in reforming healthcare services. Popularity is confirmed by Brandao de Souza's (2009) 90 academic publication review in ten countries since its Lean inception in 2001. More recently, D'Andreamatteo *et al.*, (2015) reviewed 243 articles related to Lean in healthcare. This growth in interest is associated with the Lean's double focus on customer satisfaction and employee involvement suits most cultures. Other similarities between Lean and healthcare are the focus on customers (patients), quality, safety and staff (Bohmer and Ferlins, 2006).

Despite Leans popularity, some authors believe its implementation to be pragmatic, patchy and fragmented (e.g., Proudlove *et al.*, 2008; Young and McClean, 2008). Burgess and Radnor's (2013) evaluation of Lean in English NHS Trusts found implementation tended to be isolated rather than system-wide but over time Lean's use is increasing and progressing more to Trusts' adopting a systemic approach.

Some writers are sceptical whether improvement technologies, such as Lean, can help to improve care; e.g., Kelly quotes Parker and Slaughter (1988, p40) where Lean is described as 'management by stress'. He refers to Lean in healthcare being driven by a relentless need for improvement, which is delivered by fewer staff, which can ultimately result in burnout. He reports healthcare staff having to try and reconcile the need to deliver high quality care with corporate efficiency targets often associated with Lean improvement programmes. Similarly, Seddon (2010) warns of human cost, which can manifest itself in chronic low morale. Kelly (2013) cautions austerity pressures within the global economy are likely to encourage staff in more organisations to pursue Lean to gain efficiencies.

This confusion over Lean's role is often fuelled by what some refer to as a nebulous concept; e.g., Shah and Ward (2007) report, despite many academic and practitioner publications, Lean's definition isn't confirmed. However, if we look outside healthcare, Womack and Jones (1996) helpfully define Lean's five key principles: (i) understanding *value* from the customer perspective of the; (ii) defining the *value streams* or processes that will add and deliver value to the customer; (iii) making the processes *flow* without any delays or interruptions; (iv) emphasising the need for products or services to be *pulled* at the demand or customer need; and (v) continuous improvement and the need to strive for *perfection*. These principles are often adapted for healthcare by combining principles (iii) and (iv) and including an additional principle, which focuses on the *staff empowerment*. Similarly, Toussaint and Gerard (2010) translate these principles as: focus on the patient; design care around the patient; identify value for the patient; remove everything else (waste); reduce time to treatment and the remaining journey. Radnor *et al.*, (2012) emphasise Lean's key assumptions (Table I) and suggest without these it is likely to fail. Similarly, Joosten *et al.*, (2009) report how the emphasis, particularly for Lean in healthcare, has been process-oriented and little attention has been paid to the socio-technical aspects and respect-for-humans-system.

Table I here

The focus on efficiency alone is at odds with the improvement agenda. Lean, originally introduced to improve quality, can provide cost savings but not at safety and quality's expense. During austerity the urgency in which to demonstrate these savings is much greater. The need

to view Lean (and other improvement approaches) as a philosophy, a way of doing things, a value-based approach to improvement, must not be lost otherwise healthcare risks mistakes similar to other industries; e.g., becoming too focused on implementing tools and less on the wider organisational factors such as leadership, structure and strategy (Hines *et al.*, 2011).

There is a need to develop improvement capability and capacity within organisations. This means when freeing up time it is reinvested in improvement and does not result in removing people from the organisation. Womack and Jones (1996) state that Lean should not be used as a mechanism for downsizing and any staff reduction should take place before implementation. They recognised that most managers would need to build their internal improvement capability, then as non-value adding activities are removed and processes redesigned resources must be re-invested in future improvement programmes.

A structured literature search using key terms lean, healthcare and quality improvement found 169 publications. After reviewing abstracts, 61 were removed owing to duplication and inappropriateness. From the remaining 108 publications, six key themes were identified, which provide insight to Lean's implementation and application in healthcare. As we report on these themes we also raise questions to where linking these two concepts might help QI.

First, most publications reviewed refer to research conducted in the acute hospitals (e.g., Simons *et al.*, 2017; Simons *et al.*, 2017). The most popular areas include the emergency department (e.g., Abdelhadi, 2015), surgery (e.g., Mandahawi *et al.*, 2011) and the ward (e.g. Morrow *et al.*, 2012). Few consider the patient journey beyond the initial care setting in which the research is undertaken. Lean's application within mental health (Hayward, 2010) and primary care (Chinman *et al.*, 2012) is limited, which indicates only part of the patient pathway has been the focus. The need to extend the research across organisational boundaries is challenging but necessary, which leads us to consider whether ICPs may help to work across organisational and functional boundaries.

Second, standardisation is a Lean area that has generated some debate about whether it is appropriate for healthcare. Many healthcare professionals believe standardisation and healthcare delivery are at odds, particularly as patient needs can be complex and therefore care might vary considerably. However, it is important to distinguish standardised care and the standardised processes employed to deliver healthcare services. Understanding variability and variation is fundamental to patient pathway and healthcare services generally redesign. Do ICPs help with understanding variance (when patients veer away from the expected pathways)?

Third, many studies (e.g., Radnor *et al.*, 2012) describe the tools and techniques that have been employed within improvement programmes. Although it is important for programme theory development to understand how these are being adopted for use in healthcare, there is also a need to report the benefits to patients. Much commentary focuses on how tools and techniques have been implemented and there is less evidence on impact in relation to patients and staff. Similarly, the ability to show what impact improvement programmes have on organisations at a strategic and whole systems level is missing. Before and after measures are required to help understand changes made. Many healthcare professionals make a diagnosis through data. To make a judgement about healthcare improvements evidence is needed. Does having a formal document such as an ICP prompt teams to ensure improvements made to patient pathways are formally documented?

Fourth, *sustainability* is an issue some papers allude to in relation to Lean healthcare. Specifically, Radnor *et al.*, (2012) from four UK hospital case study, report Lean to be on the 'fringes' of service transformation. Whilst the case organisations reported short term gains, most failed to deliver more widespread and sustained improvements. The main reason given for these sustainability problems was the tool-based implementation. Will integrating Lean with existing practices such as ICPs help to sustain improvement efforts?

Fifth, a main barrier to Lean healthcare is reported to stem from how healthcare organisations are functionally organised, care fragmentation and professional practice (Brandao de Souza and Pidd, 2011), which occurs owing to the constraints such silos create. Is it possible that ICPs and Lean can help to create multi-disciplinary and cross-boundary working?

Six, combining lean with other improvement approaches seems to be emerging in healthcare; e.g., Lean Six Sigma was explored by Laureani *et al.*, (2013) who examined improvement projects in one Irish hospital. The authors concluded that Lean Six Sigma offered a several methods and techniques for use on a process improvement project, but emphasised that decisions around the technique selection must be considered within each project's context. Chiarini and Baccarani (2016) examined TQM and Lean deployment in three large Italian hospitals. This case research identified a specific deployment path for TQM–Lean implementation, which achieved benefits linked to patient satisfaction and performance.

Integrated care pathways

The same review process was used for the ICP literature. The initial search found 46 publications, reduced to 29 after filtering. From the review, six key themes emerged which provide a useful insight to how ICPs are defined, designed and implemented.

First, according to Wensing *et al.*, (2013, p 248) there is no clear definition or name for what is referred to as integrated care. Related concepts include clinical pathways, disease management, collaborative care, coordinated care, shared care and case management. They propose that integrated care means “structuring ... healthcare delivery for a defined patient population, for instance people with diabetes”. Integrated Care Pathways have been linked to project management tools developed in the USA in the 1950s (Bragato and Jacobs, 2003). In practical terms integrated pathways usually involve some organisational change and educational interventions for healthcare professionals involved with the patient population group. Ouwens *et al.*, (2005) suggest integrated care comprise patient education and self-management support; structured follow-up and case management, a multidisciplinary patient care team, multidisciplinary clinical pathways, feedback, reminders and continuing education for health professionals. Many integrated care programmes seem to focus on specific diseases and in some cases chronic diseases. Wensing *et al.*, (2013) conclude that integrated care programmes can provide positive effects for patients in relation to improved care quality and their involvement within their care. However, what is less clear was the link to better outcomes. They purport that heterogenous patient populations, health professionals' involvement and integrated care programme components cloud the evidence and make it difficult to interpret. Can Lean help to reframe ICP focus to consider the healthcare processes and systems that are common to many disease groups (e.g., long-term conditions)?

Integrated Care Pathways were first introduced in the 1980s in the American healthcare system (Currie and Harvey, 1997) and have been widely adopted in other countries. A UK national survey showed in 1998 approximately 250 NHS organisations were either developing or employing pathways (Currie, 1999). The European Pathway Association (EPA, 2005, p. 1) defined care pathways as a method to support the mutual decision making and organisation of care for a defined group of patients over a specific time period. Joosten *et al.*, (2008) suggest ICPs were introduced to translate guidelines into local practice. Definitions vary; Bleser *et al.*, (2006) defined a clinical pathway as a method which clearly outlines the care required for a group of patients over a defined time period. The clinical pathway should state the goals and key elements premised on evidence-base medicine (EBM), best practice and patient expectations by facilitating communication and coordination roles, and sequencing multidisciplinary care team activities, patients and their relatives; by documenting, monitoring and evaluating variance, and by providing the necessary resources and outcomes (Joosten *et al.*, 2008, p 475).

Second, the EPA defined key ICP characteristics. These were developed further by Vanhaecht *et al.*, (2006) by identifying 17 ICP characteristics (Table II). These characteristics have to be operationalised in an ICP and can be audited systematically (Croucher, 2005; Whittle *et al.*, 2004). From their systematic review, Vanhaecht *et al.*, (2006) found that the most frequently used audit tools to examine characteristics were fixed document(s) format, pathway content and outcome management. Can Lean assist in ensuring value-based design through patient and multi-disciplinary involvement become key prominent characteristics?

Table II here

Third, the care pathway impact seems to be unclear. Several reviews found pathways linked to several outcomes (e.g., Van Herck *et al.*, 2004, Kwan and Sandercock, 2004; Vanhaecht *et al.*, 2010). Vanhaecht *et al.*, (2006) believe these wide-ranging outcomes is explained by the different study designs and implementation methods. Implementing a pathway can vary from introducing a new patient record with minor or major changes to clinical practice to care pathway redesign when delivered by a multidisciplinary team (Vanhaecht *et al.*, (2006). Will integrating Lean help to limit sub-optimising other parts of the patient journey that are not included in the ICP?

Fourth, Joosten *et al.*, (2008) purport ICPs are technologies that focus on quality improvement, especially for standardising and improving delivery processes. Similarly, Allen *et al.*, (2009) report ICPs to be most effective when patient journeys are predictable. Patient pathways that are more variable are less convincing where greater flexibility is required to accommodate more diverse needs. Integrated care pathways are most effective in bringing about behavioural changes where there are identified deficiencies in services (Allen *et al.*, 2009). Therefore, a clearer context is required before ICPs are implemented. Allen *et al.*, (2009) call for ICP originators/designers to ask critical questions about how and in which ways they want ICPs to work in practice and what is needed to ensure they deliver what is expected.

Fifth, some authors describe ICPs as quality improvement tools to facilitate redesign of care pathways (Huby and Rees, 2005) but acknowledge that their effectiveness can be variable. Pathways are used as clinical management or audit tools (Kitchener *et al.*, 1996). They have a management function in relation to shaping multidisciplinary working and care planning. In practice, the ICP can be a service redesign end-point or can be a tool to conceptualise, evaluate and improve complex care processes (Huby and Rees, 2005). Integrated Care Pathways are employed at an operational level and require a support structures to facilitate integration and organisational change, identified as: buy-in from all disciplines; multidisciplinary communication; patient involvement; and ICP audit (Hogan *et al.*, 2011).

Finally, ICPs have been identified as reducing patient stay, improving quality and clinical process expediency, increasing patient satisfaction and promoting consistent, collaborative multidisciplinary care (Whittle *et al.*, 2004; Waller *et al.*, 2007; Bragato and Jacobs, 2003). Working across organisational boundaries adds consistent care, continuity and improved collaborative working (Allen and Rixson, 2008). However, as with other QI technologies, ICPs can be influenced by the context and/or the pathway developer or leader. Difficulties often arise with ICPs where the patient's condition fluctuates over time and the care needed is not predictable and veers away from the pathway. Capturing and coping with such variance is important to pathway design. Some authors suggest that ICPs are appropriate for around 60-80% of patients within a defined population and flexibility is fundamental to using ICPs (Cheah, 2000). There are reports that some senior clinicians perceive ICPs as curtailing their clinical decision-making and in some healthcare settings, ICP implementation is not always followed (Parker *et al.*, 2005). The prescriptive nature and standardisation associated with ICPs risk staff

robotically following the rules rather than using professional judgement (Whittle, 2006). Will integrating Lean and ICPs enable benefits to be shared and limitations to be minimised?

Lean and ICPs

Rechel *et al.*, (2010) suggest that Lean offers insights in patient flow design but there is a need to be cautious with overly rigid implementation. For relatively predictable care trajectories, ICPs can be effective (Allen *et al.*, 2009). For variable patient trajectories however, they may be less effective; e.g., ICP management in stroke rehabilitation may not be flexible enough to meet the patient's diverse needs (Furaker *et al.*, 2004). Recently, Malmbrandt and Ahlstrom (2013) developed an instrument for assessing the adopting Lean in service organisations. They identify three main items that need to be considered within their measurement tool: Lean adoption enablers, Lean practices and operational performance. The authors also provide an emergent consensus Lean definition. From reviewing the top ten most cited Lean service publications, they identify ten Lean service principles. We used these principles to identify the commonalities with care pathways in our endeavour to identify potential overlaps and differences (Table III).

Table III here

As Table III shows, there are overlaps and synergies between the two approaches and instances where integrating approaches would enable what sometimes is implicit in ICP use to be made explicit with Lean (and vice versa); e.g., defining customer value is Lean's first principle, it is not explicit within ICPs. We propose there is considerable value for integrating the key principles and functions of these two technologies and provide a conceptual framework (Figure 1) for ICP designers/implementers. The integrated approach's starting point is to understand *value* from the pathway users' perspective (i.e. patient and/or carer, relative). Often this is a step that is overlooked in healthcare improvement or sometimes limited to one patient representative's token voice. Inviting patients/users to be part of the pathway (re)design is a fundamental step. *Mapping* the pathway is a diagnostic process that is prominent both in Lean and ICPs. Process activity mapping has received much attention in healthcare, but as improvement skills and knowledge matures, there is a need to consider other mapping tools and techniques that are more appropriate to what is trying to be achieved. As improvement approaches matures in healthcare, a more detailed flow analysis associated with pathways could be developed (Williams, 2017).

Figure 1 here

Pulling resources to the patient as and when needed will be essential to understanding demand for services and identifying any bottlenecks within the pathway. Having such demand information will enable capacity to be managed more effectively. *Empowering teams* and individuals to undertake improvement is essential, particularly in large, hierarchical healthcare organisations where functional and professional boundaries are often overlapping and competing, which relies on having internal capacity and capability in which to enable this to happen. As noted previously, engaging patients in the improvement agenda is crucial, which also means appropriate patient and staff training and development is required. The framework's final step is about incremental change and the ability to *sustain* and build improvements to continually work towards *perfection*. Embedding Plan-Do-Study-Act cycles within existing work patterns may help to ensure ICPs and processes are reviewed within the dynamic context that they exist. The arrows emphasise the continuous cycle needed to sustain and improve

pathway design. The link to patient flow is evaluating any variance and to feed this into future improvements.

Discussion

Synthesising the literature enabled us to raise several questions in relation to integrating Lean and ICPs. Framework development has shown how this integration might take place and its benefits. From the ICPs review undertaken by Allen *et al.*, (2009), it is evident that the contextual elements associated with ICP design and implementation are critical. Lean is one improvement technology that could help to understand the context before the ICP design is finalised. Asking patients, carers/relatives and staff about what they value about the service or pathway would give insights to how existing systems operate and where frustration or dissatisfaction may lie. However, often it is unclear who is involved in care pathway design and development. It appears that technical care, often recommended by clinical guidelines, are a priority in relation to the design. Although it is important to ensure that such guidelines are incorporated, there is also a need to design pathways that will deliver value to patients.

This discussion around value and patients leads us to consider the first characteristic: how the relationship between the nurse and patient can be improved. Understanding value from both perspectives is central to our integrated approach. Patients are becoming more involved in the services (re) design and ICP design. The second characteristic: adapting the context to create a safe and caring environment is closely linked to the first. Lean improvement is context dependent (Radnor *et al.*, 2012) and can help to operationalize ICPs that are also focused on developing a safe and caring environment. A good measurement system will assist in evaluating the improvement and the longer-term performance of the ICP.

The third component focuses on using space. The workplace organisation is a core element of Lean, which is employed to improve the environment. The integrated approach encourages multi-disciplinary working and as this matures, this should improve elements such as decision making and lessen power-differentials. The last component: self in relation to values should be integral to improvement. The time to reflect on and evaluate healthcare service/process being examined is essential to improvement and learning. The explicit value-based approach within our integrated model requires input from patients and staff.

Conclusion

Our aim was to assess whether linking Lean and ICPs can bring benefits to health care. Key themes were identified within the academic literature for Lean and [integrated] care pathways and from this analysis a conceptual framework is proposed. Further research is required to understand how this framework responds to different medical conditions. Similarly, the debate around process standardisation in healthcare needs further examination and empirical data to demonstrate clinical areas where it works well and examples where it has been problematic. Hence, the main limitation is missing empirical data. There are several areas for future research that arise from our conceptual thinking. Exploring how Lean and care pathways can be employed within co-morbidities and complexities these might bring provide further insight to operationalising this framework. We identified the overlaps and synergy between two improvement approaches, which will undoubtedly assist practitioners in their improvement efforts. Both ICPs and Lean are designed to deliver benefits to patients.

References

Abdelhadi, A. (2015), 'Investigating emergency room service quality using lean manufacturing', *International Journal of Health Care Quality Assurance*, Vol. 28 No. 5, pp. 510-519.

- Allen, D. and Rixson, L. (2008), 'How has the impact of 'care pathway technologies' on service integration in stroke care been measured and what is the strength of evidence to support their effectiveness in this respect?', *International Journal of Evidence Based Healthcare*, Vol. 6 No. 1, pp. 78-110.
- Allen, D. Gillen, E. and Rixson, L. (2009), 'Systematic review of the effectiveness of integrated care pathways: what works, for whom, in which circumstances?', *International Journal of Evidence Based Healthcare*, Vol. 7, pp. 61-74.
- Berwick, D. (1989), 'Continuous improvement as an ideal in health care', *New England Journal of Medicine*, Vol. 320 No. 1, pp. 53-56.
- Bleser, L. Depreitere, R. Waele, K. Vanhaecht, K. Vlayen, J. and Sermeus, W. (2006), 'Defining pathways', *Journal of Nursing Management*, Vol. 14, pp. 553-563.
- Bohmer, R. and Ferlins, E.M. (2006), *Virginia Mason Medical Center*, Harvard Business School Case 606-044, Harvard Business School, Boston.
- Bragato, L. and Jacobs, K. (2003), 'Care pathways: the road to better health services?', *Journal of Health Organisation and Management*, Vol. 17 No. 3, pp. 164-180.
- Brandao de Souza, L. (2009), 'Trends and approaches in lean healthcare', *Leadership in Health Services*, Vol. 22 No. 2, pp. 121-39.
- Brandão de Souza L. and Pidd M. (2011), 'Exploring the barriers to lean health care implementation', *Public Money and Management*, Vol. 31 No. 1, pp. 59-66
- Brennan, S. McKenzie, J. Whitty, P. Buchan H, and Green S (2009) 'Continuous quality improvement: effects on professional practice and healthcare outcomes', *Cochrane Database Systematic Reviews*, 4, CD003319.
- Burgess, N. and Radnor, Z. (2012), 'Service improvement in the English National Health Service: Complexities and tensions', *Journal of Management and Organisation*, Vol. 18 No. 5, pp. 594-607.
- Burgess, N. and Radnor, Z. (2013), 'Evaluating Lean in Healthcare', *International Journal of Health Care Quality Assurance*, Vol. 26 No. 3, pp. 220-235.
- Cheah, J. (2000), 'Development and implementation of a clinical pathway programme in an acute care general hospital in Singapore', *International Journal of Quality in Healthcare*, Vol. 12 No. 5, pp. 403-412.
- Chiarini, A. and Baccarani, C. (2016), 'TQM and lean strategy deployment in Italian hospitals: Benefits related to patient satisfaction and encountered pitfalls', *Leadership in Health Services*, Vol. 29 No. 4, pp. 377-391.
- Chinman, M. Hunter, S. and Ebener, P. (2012), 'Employing continuous quality improvement in community- based substance abuse programs', *International Journal of Health Care Quality Assurance*, Vol. 25 No. 7, pp. 604-617.
- Croucher, M. (2005), 'An evaluation of the quality of integrated pathways of care', Clinical Resource and Audit Group, Edinburgh.
- Currie, L. (1999), 'Researching care pathway developments in the United Kingdom: Stage 1', *Nursing Times Research*, Vol. 4, pp. 378-382.
- Currie, L. and Harvey, G. (1997), *The Origins and Use of Care Pathways in the USA, Australia and the United Kingdom*, Royal College of Nursing Institute, Oxford.
- D'Andreamatteoa, A. Iannia, L. Legab, F. and Sargiacomoa, M. (2015), 'Lean in healthcare: A comprehensive review', *Health Policy*, Vol. 119 No 9, pp. 1197-1209
- Davidoff, F. Dixon-Woods, M. Leviton, L. and Michie, S. (2015), 'Demystifying theory and its use in improvement', *BMJ Quality and Safety*, Vol. 24 No. 3, pp. 228-238.
- Dixon-Woods, M. and Martin, G. (2017), 'Does quality improvement improve quality?' *Future Hospital Journal*, Vol. 3 No. 3, pp. 191-194.
- European Pathways Association (EPA). (2005), 'Clinical/ Care Pathways', <<http://www.e-pa.org/clinical---care-pathways/index.html>> accessed July 2017.

- Furaker, C., Hellstrom-Muhli, U. and Walldal, E. (2004), 'Quality of care in relation to a critical pathway from the staff's perspective', *Journal of Nursing Management*, Vol. 12, pp. 309-316.
- Grol, R. Wensing, M. Bosch, M. Hulscher, M. and Eccles, M. (2013) Theories of implementation of change in healthcare, in Grol, R. Wensing, M. Eccles, M. and Davis, D. (eds) *Improving Patient Care: The implementation of change in health care*. 2nd ed., John Wiley and Sons, Chichester.
- Hayward, L. (2010), 'How applicable is lean in mental health? A critical appraisal', *International Journal of Clinical Leadership*, Vol. 17 No. 3, pp. 166-173.
- Hines, P. Found, P. Griffiths, G. and Harrison, R. (2011), *Staying lean: Thriving, not just surviving*, Productivity Press, New York.
- Hogan, C. Barry, M. Burke, M. and Joyce, P. (2011), 'Healthcare professionals' experiences of the implementation of integrated care pathways', *International Journal of Health Care Quality Assurance*, Vol. 24 No. 5, pp. 334-347.
- Huby, G. and Rees, G. (2005), 'The effectiveness of quality improvement tools: joint working in integrated community teams', *International Journal for Quality in Health Care*, Vol. 17 No. 1, pp 53-58.
- Joosten, T. Bongers, I. and Meijboom, I. (2008), 'Care programmes and integrated care pathways', *International Journal of Health Care Quality Assurance*, Vol. 21 No. 5, pp. 472-486.
- Joosten, T. Bongers, I. and Janssen, R., (2009), 'Application of Lean Thinking to Healthcare: Issues and observations', *International Journal for Quality in Health Care*, Vol. 21 No. 5, pp. 341-347.
- Kelly, J. (2013), 'The effect of lean systems on person-centred care', *Nursing Times*, Vol. 109 No. 13, pp. 16-17.
- Kitchener, D. Davidson, C. and Bunred, P. (1996), 'Integrated care pathways: effective tools for continuous evaluation of clinical practice', *Journal of Evaluation of Clinical Practice*, Vol. 2, pp. 65-69.
- Kwan J., and Sandercock, P. (2004), 'In-hospital care pathways for stroke', *Cochrane Database of Systematic Reviews*, Issue 4. Art. No. CD002924.
- Laureani, A. Brady, M. and Antony, J. (2013), 'Applications of Lean Six Sigma in an Irish hospital', *Leadership in Health Services*, Vol. 26 No. 4, pp.322-337.
- Malmbrandt, M. and Ahstrom, P. (2013), 'An instrument for assessing lean service adoption', *International Journal of Operations and Production Management*, Vol. 33 No. 9, pp.1131-1165.
- Mandahawi, N. Al-Araidah, O. Boran, A. and Khasawneh, M. (2011), 'Application of Lean Six Sigma tools to minimise length of stay for ophthalmology day case surgery', *International Journal of Six Sigma and Competitive Advantage*, Vol. 6 No. 3, pp. 156-172.
- Morrow, E. Robert, G. Maben, J. and Griffiths, P. (2012), 'Implementing large-scale quality improvement: Lessons from The Productive Ward: Releasing Time to Care™', *International Journal of Health Care Quality Assurance*, Vol. 25 No. 4, pp. 237-253.
- Ouwens, M. Wollersheim, H. Hermens, R. Hulscher, M. and Grol, R. (2005), 'Integrated care programmes for chronically ill patients: A review of systematic reviews', *International Journal of Quality Health Care*, Vol. 17 No. 2, pp. 141-146.
- Parker, M. and J. Slaughter (1988) 'Management by Stress', *Technology Review*, Vol. 91 No. 7, pp. 37-44.
- Parker, D. Claridge, T. and Cook, G. (2005), 'Attitudes towards integrated care pathways in the UK NHS: a pilot study in one UK NHS Trust', *Journal of Integrated Care Pathways*, Vol. 9 No. 1, pp. 13-20.
- Portela, M. Pronovost, P. Woodcock, T. Carter, P. and Dixon-

- Woods, M. (2015), 'How to study improvement interventions: a brief overview of possible study types', *BMJ Quality and Safety*, Vol. 24 No. 5, pp. 325-336.
- Proudlove, N. Moxham, C. and Boaden, R. (2008), 'Lessons for lean in healthcare from using Six Sigma in the NHS', *Public Money and Management*, Vol. 28 No. 1, pp. 27-34.
- Radnor, Z. and Osborne, S. (2013), 'Lean: A failed theory for public services?' *Public Management Review*, Vol. 15 No. 2, pp. 265-287.
- Radnor, Z. Holweg, M. and Waring, J. (2012), 'Lean in healthcare: the unfilled promise?' *Social Science and Medicine*, Vol. 74 No. 3, pp. 364-71.
- Rechel, B. Wright, S. Barlow, J. and McKee, M. (2010), 'Hospital capacity planning: from measuring stocks to modelling flows', *Bull World Health Organisation*, Vol. 88, pp. 632-636.
- Seddon, J. (2010), 'How Lean became mean', <http://www.tinurl.com/vanguard-lean> accessed June 2017.
- Shah, R. and Ward, P. (2007), 'Defining and Developing Measures of Lean Production', *Journal of Operations Management*, Vol. 25 No. 4, pp. 785-805.
- Shortell, S. Bennett, C. and Byrk, G. (1998), 'Assessing the impact of Continuous Quality Improvement on clinical practice: what it will take to accelerate progress', *Milbank Quarterly*, Vol. 76, pp. 593-624.
- Simons, P. Backes, H. Bergs, J. Emans, D. Johannesma, M. Jacobs, M. Marneffe, W. and Vandijck, D. (2017), 'The effects of a lean transition on process times, patients and employees', *International Journal of Health Care Quality Assurance*, Vol. 30 No. 2, pp.103-118.
- Toussaint, J. and Gerard, R. (2010), *On the Mend*, Lean Enterprise Institute, Cambridge.
- Vanhaecht, K., De Witte, K., Depreitere, R. and Sermeus, W. (2006), 'Clinical pathway audit tools: a systematic review', *Journal of Nursing Management*, Vol. 14, pp. 529-537.
- Vanhaecht, K., Panella, M., Van Zelm, R. T., and Sermeus, W. (2010), 'An overview on the concept and history of care pathways as complex interventions', *International Journal of Care Pathways*, Vol. 14, pp. 117-123.
- Van Herck P., Vanhaecht K., and Sermeus W. (2004), 'Effects of clinical pathways: do they work?' *Journal of Integrated Care Pathways*. Vol. 8, pp. 95-104.
- Waller, S. Delaney, S. and Strachan, M. (2007), 'Does an integrated care pathway enhance the management of diabetic ketoacidosis', *Diabetic Medicine*, Vol. 24 No. 4, pp. 359-363.
- Wensing, M. Laurant, M. Ouwens, M. and Wollersheim, H. (2013), Organizational implementation strategies for change, in Grol, R. Wensing, M. Eccles, M. and Davis, D. (eds), *Improving Patient Care: The implementation of change in health care*. 2nd ed., John Wiley and Sons, Chichester.
- Whittle, C. (2006), 'Care pathways – the future's bright', *Journal of Nursing Management*, Vol. 14 No. 7, pp. 503-505.
- Whittle, C., McDonald, P., Dunn, P. and DeLuc, K. (2004), 'Developing integrated care pathway appraisal tool (ICAPT): a pilot study', *Journal of Integrated Care Pathways*, Vol. 8 No. 2, pp. 77-81.
- Williams, S.J. (2017), *Improving Healthcare Operations: The application of Lean, Agile and Leagility in care pathway design*, Palgrave Publishers, Sweden.
- Womack, J. and Jones, D. (1996), *Lean Thinking: Banish Waste and Create Wealth in your Corporation*, Simon and Schuster, New York.
- Young, T. and McClean, S. (2008), A critical look at Lean Thinking in healthcare, *Quality and Safety in Health Care*, Vol. 17, pp. 382-6.

Table I. Lean: key assumptions (Adapted from Radnor and Osborne, 2013, p.4)

Defining value and waste from the customer (patient) or end user perspective
Creating value by either reducing non-value adding activities or increasing value adding activities at no extra cost
Appreciating there is defined and measurable benefits to the organisation
Freeing up resources that can help to continue to improve processes
Understanding Lean's heart is customer value
Ensuring the main focus remains on quality and safety rather than on cost

Table II: ICPs: key characteristics (Adapted from Vanhaecht *et al.*, 2006, p.533)

Organisational commitment	Pathway project management	Perception about pathways
Document format	Pathway content	Multidisciplinary involvement
Variance management	Evidence based medicine/ guidelines	Pathway maintenance
Accountability	Patient involvement	Pathway development
Additional support systems and documents	Operational arrangements	Pathway implementation
Outcome management	Safety (risk management)	

Table III: Links between lean service principles and care pathways (Source: Adapted from Malmbrandt and Ahlstrom, 2013, p.1147)

Lean Service Principles	Care Pathway
Define customer value	Not explicit but essential to pathway design and to enhance patient choice/centredness
Map processes	Maps the patient journey and care trajectory
Identify waste/non-value adding activities	Not explicit but essential to improving care quality
Make activities flow without any interruptions	Maps the ICP activities and aims to simplify where possible
Standardise work	Pathway Standardisation – critics view ICPs as prescriptive and curtailing professional decision making
Level and balance workload	Roles and clinical expertise reviewed in line with patient needs
Strive for high quality levels – zero defects	ICPs are seen as a quality improvement tool
Visualise processes and performance results	Mapping the pathway and defining outcomes in line with clinical guidelines is the starting point
Develop multi-functional employees	Develop multi-disciplinary teams
Pursue continuous improvement	Aiming for best practice but ICP evidence is variable

Figure 1: Integrated Lean Care Pathway Framework

