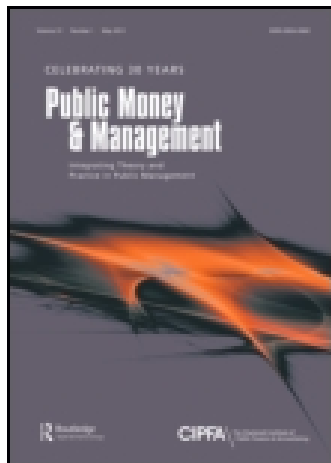


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Exploring the barriers to lean health care implementation

Luciano Brandão de Souza and Michael Pidd

This article analyses implementation barriers to lean thinking in health care, based on experience of applying lean thinking in the UK's National Health Service (NHS). It discusses the differences and similarities between lean thinking in manufacturing and health care and why lean implementation has been slower in health care than in manufacturing. The problems to be faced and overcome when implementing lean approaches are compared with those in other improvement programmes. The authors conclude that lean approaches do offer ways to improve health care.

There are three main reasons for the growing interest in using lean techniques in the NHS. First, cost pressure, despite increased funding, has stimulated a search for improved working practices. Second, national targets (now regarded as standards) for waiting times have encouraged time compression and the removal of non-value-adding tasks. Third, there are promising initial results in health care organizations in other countries (Lindberg, 2004; Tragardh and Spear, 2005; Ballé and Régnier, 2007; Ben-Tovim, 2007a; Portioli-Staudacher, 2008) and occasional reports from the UK (for example McCulloch *et al.*, 2010).

This article explains the implementation barriers to applying lean ideas in health care, based on our experience and that of others. As Proudlove *et al.* (2008) suggest, we explore implementation problems, rather than the techniques themselves (see also Brandão de Souza, 2009). Walley and Davies (2003) examined the implementation of IT systems in the NHS and concluded that internal factors have a significant impact; we, too, focus on internal factors.

We identify and analyse implementation barriers based on interviews with directors, managers and health care practitioners and on the experience of applying lean thinking in several UK NHS trusts, comparing these with the same issues in manufacturing. We conclude that, if slightly modified, the basic lean manufacturing methodology can be applied in health care with good results.

Case studies

The barriers discussed here are based on experience gained in case studies in three NHS acute trusts. The cases are not discussed in detail.

Improving the flow of medical records

The project involved three departments and was part of a pilot effort to assess the value of lean approaches in health care (Brandão de Souza and Pidd, 2008). When the project began, over 3500 patient files were stored on the library floor because staff had insufficient space and time to store them properly. Hence, records often arrived late or not at all at outpatient clinics. Members of staff were initially very sceptical about a lean approach, but eventually participated enthusiastically in a one-week kaizen blitz. Two months later, the floor was clear of patient records, there was a 3% increase in the percentage of files delivered first time on time to outpatients and staff morale was much higher. This is an example of the application of the 5S principles, which stress the importance of tidy, well-managed working areas.

Reducing lengths of stay in elderly care

As part of a strategic and cultural change plan to improve performance against national targets, a second NHS trust adopted lean as its main approach to continuous improvement (Brandão de Souza and Archibald, 2008). Two wards for the elderly had higher lengths of stay than the national average, and poor control and communication significantly delayed discharges. A structured lean approach was followed to eliminate sources of waste in these wards. Visual control and information boards were introduced, daily multidisciplinary meetings were re-introduced and new routines for ward round communication between doctors and other clinical staff were agreed. Average lengths of stay were reduced from 10 days to six days in one of the wards and from 15 days to eight days in the other, and staff morale and patient satisfaction were significantly increased. This is an example

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of the use of simple visual displays as part of a lean approach to co-ordinate activities on a patient pathway.

Reducing waiting time for audiology

A lean approach, combined with computer simulation, was used to reduce waiting times for fitting hearing aids in an audiology department (Brandão de Souza *et al.*, 2008). A serious mismatch had developed between capacity and demand, leading to an increasing backlog of over 1700 patients and expected delays of over 65 weeks for new patients. As the national target for the time between referral and treatment was 18 weeks, something had to be done.

A one-week kaizen blitz led to the implementation of new, much more consistent schedules for clinics and better organized consulting room and storage areas. These low-cost changes resulted to a 25% increase in capacity and persuaded the funders to finance extra short-term capacity in the private sector. As a consequence, waiting times are now only eight weeks. This is an example of the use of the 5S principles and level scheduling, both part of the lean approach.

Barriers to lean health care implementation

Examining the literature, Radnor *et al.* (2006) suggest the following implementation barriers for lean thinking in public services:

- People: mainly referring to scepticism about change programmes in general.
- Lack of ownership: either of current activities or of proposed processes.
- Identity of improvement team members: often made up of those willing to get involved, rather than those who should do so.
- Leadership failure.
- Compartmentalization: functional and professional silos.
- Weak link between improvement programmes and strategy.
- Lack of resources.
- Poor communication: the over-use of jargon and the lack of a clear message to staff.

We draw on the literature of lean in both manufacturing and health care, together with our own experiences in the three cases above, to identify major implementation barriers in health care. Table 1 summarises the barriers

Table 1. Barriers to lean health care.

Barrier	Evidence	Incidence
<i>Perception</i>	Manufacturing myths and lack of understanding of lean principles among health care professionals is seen as a barrier	(H)—Unique to health care
<i>Terminology</i>	Introduction of new language is a common issue for implementing lean in any setting. In general, health care professionals responded well to the introduction of new vocabulary and it helped them to shift from old to new practices	(M and H)—Common to manufacturing and health care
<i>Personal/professional skills of health care professionals</i>	There are intrinsic differences in personal and professional skills between health care and manufacturing professionals and these differences are seen as a barrier. In the particular case of the NHS, it becomes clear that the fire-fighting mentality acts as a practical barrier in the introduction of lean	(H)—Unique to health care
<i>Organizational momentum</i>	The constant change of strategy for improvement (locally) and governmental policy (nationally) inhibits the continuity of potentially successful programmes	(M and H)—Common barrier but emphasised in health care due to its complexity
<i>Professional and functional silos</i>	The fragmentation of health care into silos (professional or functional) imposes a major barrier to the flow of patients, goods and information and consequently to the implementation of lean techniques in hospitals	(M and H)—Common barrier but emphasised in health care due to its complexity
<i>Hierarchy and management roles</i>	Cultural issues based on the hierarchy of health care staff and the way management roles are allocated typically become a barrier for any improvement but this is especially important when lean is introduced	(H)—Unique to health care and also frequent in the public sector
<i>Data collection and performance measurement</i>	Lean implementation usually reveals problems in data collection and poor performance measures in most aspects of patient care. This often amplifies the need for cultural change in health care settings	(M and H)—Common barrier but emphasised in health care due to its complexity
<i>Resistance to change/scepticism</i>	Resistance to change is a significant problem in any improvement programme in any organization. It deserves special attention from those attempting to implement lean, since staff empowerment, which is a key issue in the lean theory, is needed for engaging health care professionals	(M and H)—Common to manufacturing and health care

and compares them with those found in manufacturing. This leads to a slightly different classification from that found in Radnor *et al.* (2006).

Perception

Manufacturing myths: The Manufacturing Institute (2005) reports how people perceive manufacturing in the UK: manufacturing jobs are considered to be monotonous, strenuous, low-paid, with minimal career progression and not academically demanding. The manufacturing environment in the UK is seen as dirty, depressing and dangerous; the manufacturing industry in the UK is perceived as unglamorous, low-tech and uncreative. However, manufacturers that incorporate lean as a main improvement philosophy, such as Airbus (www.airbus.com) and Siemens (www.siemens.co.uk) are a long way from this grubby, low-status image. The Manufacturing Institute has challenged these myths with several case studies, concluding that manufacturers must replace these myths with facts, working together to communicate a more positive image.

Not surprisingly, our informal discussions with health professionals during lean implementations (kaizen weeks) confirmed that lean thinking's manufacturing origins caused some to limit its potential use in health care based on these manufacturing myths. This implementation barrier can be overcome by clarifying the nature of lean health care and by providing evidence that it works.

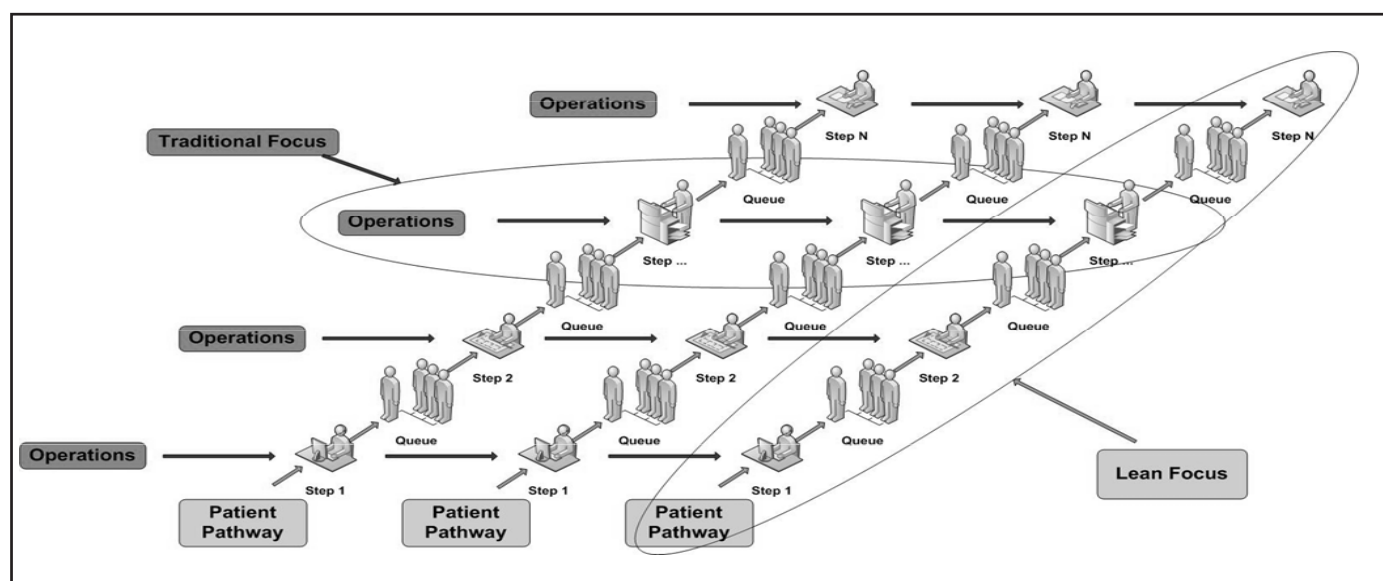
During our case studies there was a common misbelief among professionals that a patient

might be treated as a 'piece of metal'—humanity would disappear from health care. It is important to emphasise that lean focuses on reducing non-value-adding activities, which usually means those activities that do not involve patient contact such as 'paperwork'. There is no intention in lean to reduce human contact between patients and clinicians, there may, instead, be an increase in the proportion of touch time. In the elderly care case study, significant nursing time was released by eliminating non-value-added activities, which increased the time spent with patients, which is what nurses prefer.

Every patient is different: Some health care professionals argue that every patient is different, unlike every manufactured product in a factory. This is a misunderstanding of lean health care, since patients are not considered identical, but offered similar treatments if they fall into similar categories. A patient pathway is a sequence of care operations (procedures) shared by a group of patients (cluster or 'patient-care family') that are sufficiently similar to one another (Ben-Tovim, 2007b). Crosby (1989) defines quality as conformance to requirements—increasing quality means reducing variance from a standard (the most appropriate pathway). This can be controversial, but does not mean that all patients are treated identically: it is an attempt to provide better care for all.

A hospital can be viewed as a set of parallel patient pathways that may or not share common resources (see figure 1). Patients still receive individual treatment by clinicians and are not

Figure 1. Resource versus pathway view.



forced into clusters, but they often fall naturally into one. The Joint Commission on Accreditation of Healthcare Organizations (2006) argues that most hospitals tend to employ 'traditional management thinking', with a focus on individual health care activities rather than processes. With traditional management thinking, also still evident in manufacturing, local improvement (or improvement in the operations) is prioritized. By contrast, lean thinking shifts the focus of improvement from individual tasks to the process (or patient pathway), as a set of activities that should be completed in the proper sequence at the proper time to meet patient needs. Lean works best if applied to the process, starting with establishing the need for a service, through to delivering that service without interruption in the flow.

It should also be noted that improving a single patient pathway may not be enough. For instance, in elderly care, the reduction in bed occupancy (from 100% to around 80%) paradoxically caused a problem by creating vacant beds. Once visible on the bed management system, empty beds were filled by non-elderly patients for whom beds could not be found anywhere else in the hospital. It is important to improve parallel patient pathways by carefully considering the interactions between them.

Terminology

Any organization using lean thinking as its main improvement philosophy needs to integrate new terminology into its vocabulary (Lean Enterprise Institute, 2003). A complete adoption of lean terminology is rarely needed, so long as the underlying concepts are used. Some regard the introduction of new terminology as an implementation barrier for lean health care. Some lean implementations use Japanese words such as:

- Muda (waste).
- Kanban (production signal).
- Kaizen (continuous improvement).
- Heijunka (production levelling).

Also, non-Japanese terms, such as 'takt-time', 'push/pull systems' and 'value-adding activities', have definite meanings within lean thinking, which may differ from their common usage. However, the same problem occurs when lean is applied in manufacturing. Sometimes, as in the medical records and audiology case studies, the introduction of lean terminology seems to help staff shift to new work practices.

However, it is not essential to use the

Japanese terms. The audiology case study, for example, introduced mistake-proof systems which were not referred to as 'poka-yoke'. It is extremely important, though, to develop a common vocabulary to be used across the whole organization for lean implementation. Inconsistencies in terminology between different departments can lead to serious misunderstandings. The important issue is the idea and not the name, though some terms do need to be adapted. In a patient-related application for instance, it would be inappropriate to refer to lead time or work-in progress if terms such as waiting time or waiting lists are already in use. Ideally, once lean is introduced, its use is not restricted to rapid improvement events (Fillingham, 2008), but becomes part of the organization's culture. A new vocabulary, therefore, might become part of everyday usage if terms appropriate to the existing terminology of the organization are adopted.

Personal/professional skills of health care professionals

Ben-Tovim *et al.* (2007a) argues that health care managers are generally chosen for their problem-solving skills, particularly 'fire-fighting', and usually enjoy the drama involved—an observation confirmed in the case studies. However, lean practice is not based on finding quick, temporary solution to problems, but on understanding the root causes of delays and other impediments to flow.

To shift the focus of health care managers from a problem-solving and fire-fighting approach to careful analysis, and to change their decision processes from experience-based to data/evidence-based will always be a challenge and is a real implementation barrier. Lean thinking requires a balance between quantitative and qualitative skills that may require health care practitioners to develop proficiency in using quantitative tools. These may be needed to increase efficiency within health care, as part of an effort to improve performance measurement. Lean health care need not be introduced in a single big bang, but can focus initially on the qualitative side and still produce good results. However, it remains true that a right balance between quantitative and qualitative skills is needed for further and continuous improvement.

Organizational momentum

Lean is not a quick fix, but a continuously evolving programme of work. This is not always recognized in practice (Esain *et al.*, 2008; Proudlove *et al.*, 2008). A continuous

improvement programme requires substantial effort at the start, including training, piloting and overcoming some of the barriers described here. The rate of change in a typical lean programme may be initially slow until organizational momentum is acquired. At this point, a culture of improvement is created and improvement becomes a 'day job' rather than a series of conceptual events that happen in discrete points of time.

Starting a lean programme with a big-bang initiative, no matter how well organized, can still lead to failure if not continued as cultural improvement. Lean requires the effective participation of those involved in a process and it is very important to learn how to take advantage of this participative and engaging environment (Bowen and Youngdahl, 1998). The medical record case study was part of a successful kaizen blitz, with benefits clear to all involved. Unfortunately there was a delay in appointing a senior manager to take charge of lean—the momentum and excitement was lost as a result and the pilot project became just another improvement attempt. Thus, in order to maintain organizational momentum, it is essential to sustain the improvements made. This can be helped by the standardization of procedures using a 5S approach, which is often recommended as a starting point to lean (see for example Esain *et al.*, 2008).

Professional and functional silos

Some of the main barriers to lean health care stem from the current structure of fragmented care and professional practice, seen in many hospitals as professional and functional silos. A professional silo occurs when health care practitioners are separated into professional groups. A typical hospital may have over 100 such, that can be classified into two main groups:

- Care providers (for example doctors, nurses and physiotherapists).
- Non-care providers (for example managers, secretaries and cleaners).

Some of these silos can further divided into sub-silos each with their own clear status and seniority distinctions. For instance doctors include 30 other sub-silos such as GPs, consultants and trainees. Not surprisingly, the combination of these professional silos leads to an amazingly complex structure that compromises and communication and interaction.

A functional silo contains members of many different professional silos; for example, the

General Medical Council (2009) named over 50 clinical specialties. Other types of functional silos perform specific tasks, such as imaging and pharmacy. Functional silos lead to fragmented care (Mann, 2005), which may mean that pressure to improve performance results in suboptimization (in single silos) that may not result in overall improvement of care provided to patients. Lean health care principles support the improvement of the complete care process, from arrival to discharge, rather than a series of disconnected steps. The medical records case provides a good example of three functional silos in the flow of medical files, namely medical records, medical secretaries and outpatient clinics. Lean was used to improve the flow of medical files, which led to better care in outpatient clinics.

To cut across silos, lean stresses the creation of multidisciplinary teams with no hierarchy, in which decisions are made jointly and implemented during the kaizen blitz. There are, of course, ethical and practical reasons for some professional silos, since only some people are demonstrably competent to perform some health care tasks. However, experience suggests that a well-facilitated multidisciplinary team can find creative ways to remove some flow impediments by shifting tasks and responsibilities. In the elderly care case, the lean improvement programme encouraged greater co-operation between doctors, nurses, occupational therapists, physiotherapists, pharmacists and other allied health care professionals to provide better care.

It is likely that, of the two, functional silos may be more detrimental and may be harder to overcome, requiring more radical changes in current structures. However, this situation is not unique to health care, being also observed in manufacturing, and it could be that the good results achieved by dissolving them in manufacturing (Womack and Jones, 2005) will also occur in health care.

Hierarchy and management roles

The hierarchical structure evident in NHS silos can be a further barrier to process improvement, particularly to lean health care. Managerial duties are often designated to excellent health care practitioners, untrained as managers or leaders. Doctors enjoy much greater power than other professional groups, but it seems unwise to assume that the best manager for a department is the senior clinician, unless he or she has an aptitude for management and is appropriately trained. Members of lean improvement teams are from different

professional groups and should operate outside the hierarchy, so as not to favour the views of the powerful, as was observed in the audiology and elderly care case studies. A typical first step in starting lean is to train a multidisciplinary set of professionals who will later become lean 'heros' by demonstrating its value across the organization.

Ben-Tovim *et al.* (2007b) discusses another barrier to lean health care caused by hierarchical and cultural issues: health care managers see their role as having to come up with a solution once a problem is identified. By contrast, lean thinking implies an inverted flow of solutions/ideas (from top-down to bottom-up—see figure 2), recognizing that front-line staff understand the most about the problems they face each day.

Data collection and performance measurement

Performance measurement is a key component for successful implementation of lean approaches (Kollberg *et al.*, 2007)—in order to know how well a system is performing, we need to measure its performance based on sound data collection and analysis. Without such measurement, it is impossible to select options for improvement and impossible to know whether changes have led to improvement. Hence, there is a need for performance measurement before and after a change is made.

Great care is required if performance measurement is not to lead to undesirable side-effects. Many years ago, Ridgway (1956) argued that measurement, once introduced, is often interpreted by staff as defining the important aspects of the job or activity in which they are

engaged. Hence, it is important to understand the motivational and behavioural consequences of any performance measurement. Smith (1995) extended this argument to consider the effects of publishing performance data, which can lead to many different types of dysfunctional behaviour if not carefully planned.

A further problem in the UK is that performance measurement is often associated with centrally-defined targets, especially in health care. Although targets do seem to have been effective, leading to significant reductions in waiting times, there remain concerns that centrally-imposed measurement may distort local priorities or may lead to a focus on clinically unimportant activities. There is also concern that measurement is used as the basis of league tables in which different activities or providers can be compared and inappropriately praised or blamed for good or bad performance. Thus, some view performance measurement with continued suspicion.

Perhaps the best way to counter such suspicion is for lean improvement teams to agree and define their own performance measures with appropriate technical support. Such measurement helps the teams gain a clear view of the effect of the changes for which they are responsible and also provides the basis for continued high performance. It seems unlikely that teams will be given a completely free rein in this, but some measure of autonomy seems important. Such new measures of performance were successfully implemented in the medical record and audiology cases, pleasing staff involved and managers.

Resistance to change/scepticism

Resistance to change is a problem in many, possibly all, organizations and there is a vast academic literature on this topic. Del Val and Fuentes (2003) offer a thorough review, pointing to many sources of resistance within a broad context. Plamping (1998) discusses resistance to change in the NHS and proposes a framework to minimize problems. In our case studies, the resistance encountered was not based on opposition to lean ideas but on the simple fact that changes would be required—people are often worried about change.

One way to overcome this barrier is a small-scale pilot project as described in Brandão de Souza and Pidd (2008). It may be best to do this in a manufacturing-like area of the hospital (for example a laundry), as the adaptation of the lean principles is more straightforward in such areas. Note, though, this creates a risk that lean may be regarded by some as unsuitable for

Figure 2. Top-down versus bottom-up flow of ideas.

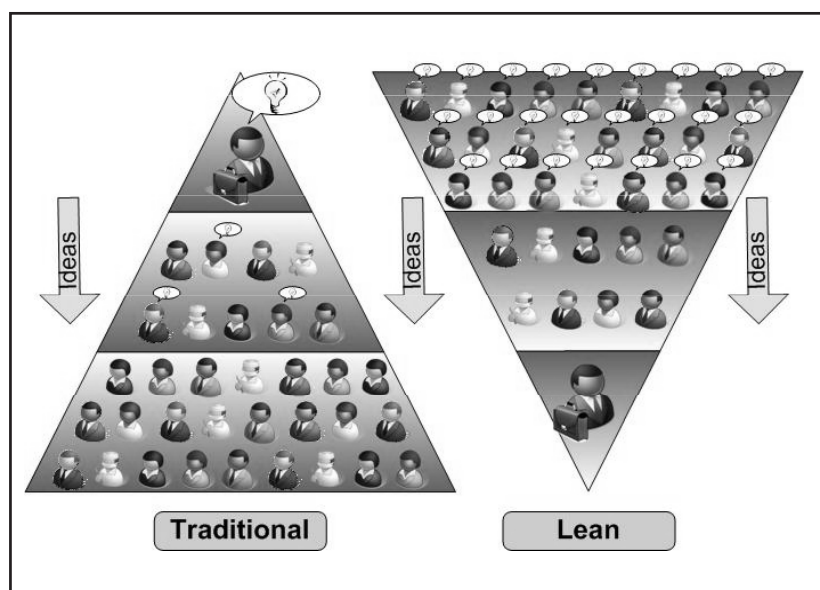
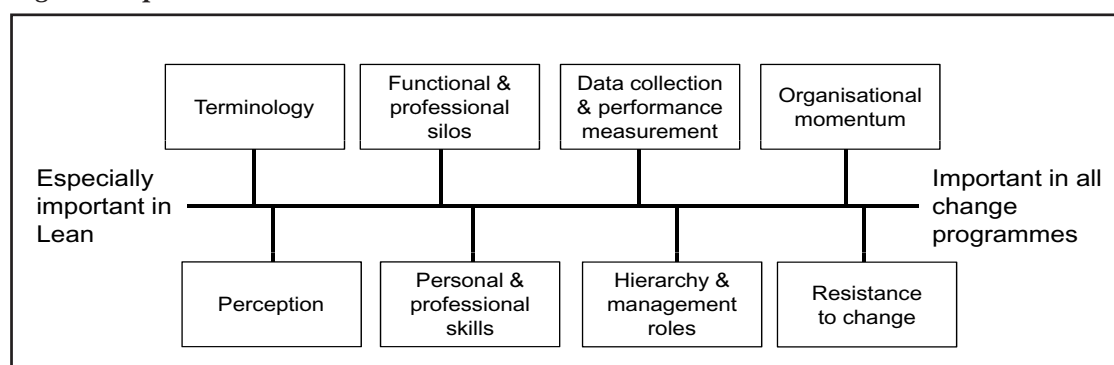


Figure 3. Spectrum of barriers.



improving the performance of patient pathways, though acceptable in peripheral service activities.

Conclusions

Our experience is that lean methodology can be successfully applied in health care without major modification, provided implementation barriers are understood and overcome. We presented a list of barriers based on experience and interviews with professionals in the NHS and related those barriers to the lean principles in order to argue that lean can produce good results. We find ourselves agreeing with Fillingham (2007) that implementation is a stressful and difficult journey. We agree with Radnor *et al.* (2006) that many of the barriers are people-based or organizational but we argue that performance measurement, inappropriate jargon and a worry that people will be treated like widgets are also significant barriers. The implementation barriers for lean health care have considerably delayed its adoption compared to manufacturing.

Some barriers are common to other change and improvement programmes, but others seem to be much more important in lean. Examples include perception, caused by lean's origins in manufacturing; and, terminology, originating in lean's Japanese background. Figure 3 places the barriers on a spectrum, varying from those much more important to lean and others shared by all transformational programmes. Working from left to right, terminology appears as a barrier exclusive to lean, as the introduction of new terms is an important feature of lean approaches. Perception is another barrier that affects lean more than other improvement approaches, since it is well-known that lean originated in manufacturing. Functional and professional silos, or compartmentalization (as in Radnor *et al.*, 2006), are seen as a major barrier to lean implementation because lean focuses on process

thinking, which requires the elimination of impediments to the flow of patients. This contrasts with other, more locally-based improvement programmes that may not see functional silos as a barrier (Goldie and Sheffield, 2001).

The existing professional and personal skills of health care employees sit in the middle of the spectrum, since they affect all change programmes of a quantitative nature. Similarly, data collection and performance management only affect improvement approaches that permit the local redefinition of measures, shifting from centrally-imposed measurement. Hierarchy is located towards the right end of figure 3, as a barrier common to some other improvement programmes, though more acute in lean, which may challenge the hierarchical structures—which other improvement approaches may accept as an unchangeable feature of health care. In general, however, hierarchy is a common problem to most improvement programmes. Almost at the right end of the spectrum is organizational momentum, probably a barrier to any continuous improvement programme. Finally, resistance to change is a barrier that any improvement approach must overcome.

Our experience showed that, with the right level of motivation and structure, health care practitioners will commit themselves to change if decisions are kept under their control. Lean health care provides this structure, motivates health care professionals and gives them ownership to change their working practices. If rather more than lip service is paid to these principles, then the number of implementations could grow considerably in the next few years. It remains a challenge for academics and practitioners to evaluate these initiatives from a critical perspective to decide if lean health care is just another fashion that will pass, or a valuable improvement philosophy that all should take seriously. ■

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