

# Eliminate NHS losses by adding Lean and some Six Sigma

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## CURRENT SITUATION

Over the last 8 years NHS funding has increased by £41 billion to about £98 billion, several times more than the rate of inflation. This has helped to reduce waiting lists and waiting times to historically low levels. Despite this extra investment the NHS is still experiencing high numbers of Trusts in financial deficit and patients are still experiencing delays.

From 2008, it is planned that future increases in healthcare spending will revert to about 3% per year. The NHS must look for alternative ways to improve quality and productivity, reduce waste and lower its costs. Industries in a competitive environment have successfully used continuous improvement approaches and techniques for over 50 years. Two of the more powerful and results orientated are Lean and Six Sigma.

This article introduces these methods and discusses and illustrates how they can be successfully applied to the NHS to improve productivity, reduce waste and lower NHS costs. This is of significant interest to us all as patients and taxpayers as well as to the NHS managers and to Operations Managers generally.

## WHAT IS LEAN SIX SIGMA?

**Lean** is an approach that seeks to improve flow in the patient journey and eliminate all forms of waste. It's

the process of identifying the least wasteful way to provide value to customers.

**Six Sigma** uses a powerful project management framework and statistical tools to uncover root cause problems. It's about doing things right first time, defect free. Clinicians and managers like to have good quantifiable evidence of any change.

The key to both approaches is to abandon the typical ineffective weekly hour long management meetings in favour of establishing small teams of experts from the 'shop floor'. This small team of 6 – 8 staff from the different departments involved in the process are trained in system thinking and service improvement. They are given powerful data-driven tools to solve their problems within a week. This creates rapid transformational improvement at lower cost with highly motivated staff.

Both Lean and Six Sigma have the same goal of continuous improvement but it is reached by asking different questions. In reality, a pragmatic approach needs to be taken, picking the best bits of each approach to use for the problem that needs to be solved.

## KEEP THE FLOW MOVING TO CREATE CAPACITY AND TO REDUCE COSTS

NHS leaders and staff previously have not fully understood how patients and their information

(referrals, appointments, X-rays, pathology specimens, reports, coding information etc) flow through their organisations and departments. Managers and clinicians have continued to try to optimise their organisational or departmental activity and costs, with no reference to the bottleneck in the system that governs the rate at which patients and information flow along the system or pathways of care. For example, in order to hit the 4 hr A&E target, the 'solution' was to install expensive assessment units with an average of £1 Million capital costs and £750,000 running costs per year. These failed to address the bottleneck – the rate of arrival of the ambulances and the rate at which 1 junior doctor can assess patients and initiate a treatment plan - so the assessment units became expensive warehouses which removed patients out of A&E at 3 hrs 59 minutes, but with no improvement in the throughput of patients or the quality of care they received. Once the assessment unit fills up, patients are still stored as 'outliers' elsewhere in the hospital.

## DOES THIS PROCESS-BASED MANAGEMENT THINKING WORK (LEAN AND SIX SIGMA)?

Toyota pioneered this Lean thinking as we know it. They produce more cars with fewer defects, using fewer employees and are predicted to overtake General Motors as the

World's number 1 car manufacturer in 2010. They have been implementing Lean for over 60 years. Their philosophy was captured by James P. Womack and Daniel T. Jones in their book 'Lean Thinking'.

Six Sigma has been used since the 1980s and was originally developed by Motorola and championed by the multinational company General Electric. It uses statistical tools and analysis to identify the root cause of variation so that teams avoid jumping to a solution.

Companies that apply these approaches at a strategic and operational level across the whole value stream become very successful. Tesco is becoming one of the World's most successful and profitable retailers by implementing these approaches.

*The point to be made is that these approaches are not fads, they are essential to improve and survive in a competitive, price driven and competition led market.*

## WE NEED TO CHANGE THE MINDSET AND CULTURE IN THE NHS

The NHS has traditionally focused on measuring and monitoring their department or organisation's activity in the belief that high activity will result in economies of scale and lower costs.

## THE ALTERNATIVE WAY OF THINKING

If we take a process perspective of our healthcare business and understand the demand (requests) for services, we could plan capacity to meet the patient demand. Doing this will significantly lower costs because we won't have to spend time and money managing queues. Also, we will not have to keep redoing things because we didn't provide the care in the right place at the right time.

To do this we must recognise that all patients are different but can be grouped by the processes they require. Patients requiring the same skills and technology have a similar rate of processing (cycle time) and can be grouped together into a separate process.

For example, one of the more

effective improvements in the A&E department is to separate the minor injuries from the major and resuscitation processes. Patients with minor conditions have a huge variety and range of conditions but all require a quick simple process to sort them out by experienced staff with minimal equipment. Processing the majority of patients in less than 20 minutes improves the overall time in A&E for the vast majority of patients. The majors and resuscitation patients are fewer in number, but require different skills and technology and have much longer cycle times. Mixing minors with majors is like putting a lorry into the fast lane on a motorway. It slows the speed of the whole motorway.

The characteristics of the future mindset are listed in Table 1.

## SO DOES LEAN AND SIX SIGMA WORK IN HEALTHCARE?

### CASE STUDY – Reducing turnaround times in pathology at Hereford Hospital

Turnaround times in pathology at Hereford Hospital were reduced by 40% in 7 days by improving the

flow of the specimens through the department and eliminating wasteful activities, such as unnecessary staff movements like searching and looking for things. Six Sigma techniques were used to understand the size of the problem, measure the variation in demand in workload and analyse the data to understand the root causes of the problem. Productivity improved by 252% at peak times and staff also finished processing the work 15 minutes earlier than they did previously. £365,000 a year will be saved every year because inpatients can now be discharged quicker, shortening length of stay and creating extra capacity in the hospital. This will enable the hospital to generate more income through payment by results (PBR) and lower its costs by having the same capacity with fewer beds. Up to 50 minutes in specimen reception have been reduced by over 90% by manning specimen reception. Staff now see the work arrive and start processing it immediately. By manning specimen reception with staff that were previously located in the main labs, and implementing standard working procedures, average delays in specimen reception have been reduced from about 13 minutes to

Table 1

### The shift in mindsets leaders need to achieve

Traditional Mindset	Future Mindset
Management focus is the organisation	Managers focus on delivering value to patients
Silo working – sub optimisation	Systems thinking
Maximise use of capacity	Minimise cost of capacity
Delays are part of the system	No delays are experienced
Reduce cost	Reduce waste
Quality costs money	Quality saves time, money and lives
Hierarchical structures – no flow	Team organised by flow – based on value stream
Activity is important	Understand demand and plan based on this
Reactive fire fighting	Proactive – planning, learning and coaching
Short term results – balancing the books and hitting targets	Long term survival and growth
More resources are required to deal with problems	The problems generating the waste are understood so existing resources are more productive

under 1 minute (green line). The maximum variation has reduced from over 30 minutes to under 4 minutes.

Improving the turnaround times in pathology has helped improve the performance of the A&E department and the 4 hour target. Most patients receive their pathology results within 45 minutes. This enables decisions to be made more quickly in A&E.

Delays in specimen reception in pathology at Hereford Hospitals have been virtually eliminated by applying Lean and Six Sigma principles.

### ARE LEAN AND SIX SIGMA VARIATIONS ON THE SAME IDEAS?

Yes – both approaches aim to achieve the same goal: to improve quality and lower costs **at the same time**. There is a different logic behind each approach. The differences are summarised in the Table 2 below.

### TEMPTED BY THE CHALLENGE? WHERE DO YOU START?

It is best to start implementing some basic Lean principles (value stream

mapping, visual management, work standardisation) combined with some of the basic Six Sigma tools to understand variation and the current baseline measurement of our processes (Statistical Process Control). Pareto diagrams (80% of the problem is due to only 20% of the causes) help to identify what problems are important and where to focus attention. Cause and effect diagrams help teams to understand the root cause of these problems. In reality use the best bits from each approach.

Table 2  
Lean and Sigma

Methodology	Lean	Six Sigma
<b>Theory</b>	Improve flow and eliminate waste	Eliminate defects and reduce variation
<b>Application guidelines</b>	<b>Specify Value</b> What is important in the eyes of the patients and staff?	<b>Define</b> What is important?
	<b>Understand Demand</b> What is the type and frequency of the demand?	<b>Measure</b> How are we doing?
	<b>Flow</b> How will the patient and information flow through the patient journey?	<b>Analyse</b> What is wrong?
	<b>Pull</b> How can we create pull in the patient journey rather than pushing patients and information round the system?	<b>Improve</b> What needs to be done?
	<b>Perfection</b> How can we optimise the patient journey?	<b>Control</b> How do we sustain the improvements?
<b>Focus</b>	Flow	Problem
<b>Assumptions</b>	Waste removal will improve performance. Many small improvements help to build and develop a culture of improvement	System output improves if variation in all processes is reduced. Figures and numbers are the valued way of identifying problems.
<b>Primary effect</b>	Reduced flow time	Uniform process output
<b>Secondary effects</b>	Less variation Uniform output Less inventory New accounting system Flow metrics Improved quality	Less waste Fast throughput Less inventory Variation metrics Improved quality
<b>Criticisms</b>	Less emphasis on statistical analysis and tools	System interaction between processes is not considered. Processes are improved independently

The full benefits of Lean Six Sigma will only be realised when applied at both strategic and operational levels. Application at the operational level results only in cost reduction, whereas application at the strategic level results in wider benefits for the organisation.

## WHAT DO ORGANISATIONS NEED TO INVEST IN TERMS OF TIME AND MONEY TO GET THE BEST OUT OF LEAN AND SIX SIGMA?

**3 CRITICAL SUCCESS FACTORS ARE ESSENTIAL FOR THE NHS TO ACHIEVE TRANSFORMATIONAL RESULTS AND LOWER COSTS.**

**1. Leadership (managerial and clinical)** – Senior leaders need to lead by example and demonstrate that they are committed and actively involved in transforming their organisations. NHS Boards need to build continuous improvement thinking into their delivery strategies. Senior leaders need to spend more time in the workplace (where the work is done). They need to understand the issues, delays and frustrations that staff and patients are facing every day. Staff at all levels of the organisation need to be empowered to improve, doing this will help sustain any improvements.

80% of Toyota senior managers' time is spent on the production line, learning how the work is done. They are then in a position to listen and observe what is happening.

**2. Organise activities by patient and information flow (Value Streams) rather than by functional departments. Accounting structures and reports also need to be organised in this way.**

Someone in the organisation needs to be responsible for the whole value stream and have the influence to remove blockages and delays.

We would recommend that you begin by improving areas where you will identify significant financial savings and avoid reducing capacity at any

bottleneck. This would slow the flow of patients, extend their length of stay, and reduce income generation. To build excitement and enthusiasm organisations need to get results quickly.

**3. Dedicated improvement expertise is essential -**

Internal capability needs to be developed within organisations. This will help build and develop a systems-thinking culture that is required for continuous improvement. *Investment in this is crucial to the long term financial viability of NHS organisations.*

## CONCLUSION

It is essential that organisations start to arrange themselves as a system with defined flows for patients and information rather than a collection of individual silos. We need to create and build a long term improvement culture that improves flow and eliminates waste from the whole system rather than a short term reactive culture that focuses on hitting financial and performance targets and cutting costs.

The risk of not investing in this type of approach is significantly greater than continuing to manage healthcare organisations as we are currently doing. We must learn from Tesco and Toyota. It is no coincidence that they have become two of the world's most successful and profitable companies by following and developing their own improvement approaches. The NHS needs to create and grow its own version of Lean Six Sigma for the NHS.

The amount of money and time needed to invest will depend on the size of the organisation. Many organisations already have expertise in service improvement. We need to build on this and implement a more formal and structured approach to service improvement that will aid the quality of services we provide at lower cost.

More information on Lean and Six Sigma can be found at <http://www.institute.nhs.uk/lean>

## QUESTIONS AND ANSWERS

### What is the finance director's role?

The finance director's role is crucial for success. Finance directors need to challenge existing financial systems, based on monitoring activity and balancing individual departmental budgets. They must start to manage the finances of the business processes and their focus should be on improving the finances for the whole system including that of their suppliers and customers up and down stream.

Finance managers should monitor demand (requests) not output (activity) and create flexible accounting systems to move money around the healthcare system as demand changes.

They also need to challenge the short term financial decision-making and the idea that organisations must always balance the books every financial year. For example, in many organisations of the NHS, Finance Directors are imposing blanket cost cutting measures across all departments. If this is done without understanding the flows and bottlenecks, capacity at the functional bottleneck could be reduced. This will delay patients, increasing the waste and reducing income. Overall this will cost more money and will destroy NHS organisations, making many vulnerable and financially unviable.

### Getting finance managers involved.

Finance managers should be mapping the processes by which patients and information are processed. They should assist their colleagues on the shop floor in identifying the cost of the activities within the process based on the cycle time (time taken to complete a task), staff costs and the cost of the materials and technologies involved. In this way all staff will understand the value and cost of the processes and where the most wasteful activities are.

For example, staff time spent

searching and looking for things because things are not in the correct place; staff asking for the same patient information several times; wasted movement of people and patients because processes are not organised to have the right things in the right place at the right time (staff and equipment) will reveal just how much resource is being wasted on a daily basis. Finance managers then quickly calculate what the return for investment in alternative technologies (e.g. PAC or voice activated dictation system) or better layouts would be.

The NHS financial situation is demanding that organisations find savings fast. But most people recognise that continuous improvement is now a prerequisite to financial viability (especially given the efficiency savings built into the tariff).

### **So what pay-back period should Finance Directors expect from adopting Lean or Six Sigma?**

Typically, what you see is that the staff will be energised and highly motivated by implementing a combination of approaches. We have observed that productivity has significantly improved in pathology at Hereford Hospitals by 252% at peak times of the day. Staff are also wasting less of their time – 40 minutes a day was saved by eliminating steps that were not adding any value, staff were double handling the specimens.

### **Can they help cut costs in year one, or are the rewards further down stream?**

The gains in the first year will be in terms of improving quality, reducing delays and improving productivity. It is not very motivating for staff if they improve themselves out of a job. If jobs are no longer required, staff should be deployed to improve other parts of the organisation. Staff can then be lost through natural wastage. Techniques can also be used to find out the correct number of staff that are required to complete a given task.

This is why strong leadership

and long term thinking is required. Lean Six Sigma is not a magic solution that will solve all your problems overnight. If implemented in the correct way the financial gains will far exceed even conservative estimates.

This is why Tesco and Toyota are amongst the most profitable and successful companies in the world. Tesco has become one of the world's most profitable retailers in less than 9 years. £1 out of £7 in the UK is spent at Tesco.

### **What are the costs/obstacles to introduction?**

- Lack of leadership commitment
- Lack of systems thinking
- Financial reports reinforce silo working and hierarchical management
- No resources for improvement or lack of prioritisation for service improvement (it is not valued)
- Hierarchical organisational culture
- Not part of a strategic approach
- Poor communication.

### **‘We can’t afford such a huge upfront time commitment of pulling people off the day job to concentrate on improvement.’**

So how much time is being wasted in weekly hour-long management meetings that deliver very little over a very long period of time?

A pragmatic approach can be taken if you have a small dedicated improvement team to help organise and facilitate the improvement. You don't necessarily have to run 4-5 day rapid improvement events to improve. This can help accelerate improvements but other approaches are equally effective. Many improvement teams work directly with frontline staff and go to them to understand the processes, to collect information and achieve significant improvements.

### **‘Lean says you should promise no staff redundancies – the savings we need can’t be delivered from natural staff turnover.’**

You need to be realistic about this. The ideal is no compulsory redundancies; however we live in the real world. You need to make a financial business decision. If organisations are spending more than they are receiving in income this is not sustainable, or financially viable. Therefore, staffing levels may need to be reviewed.

### **About the authors**

**Neil Westwood** is an expert in Lean thinking, Six Sigma and other continuous improvement approaches, working for the NHS Institute for Innovation and Improvement and Hereford Hospitals NHS Trust. He has helped to successfully translate Lean principles and approaches for the NHS and has achieved significant reductions in delays and improvements in quality. Working across the healthcare system, he has expertise in applying systems-thinking to improve the whole healthcare system.

**Dr Kate Silvester** BSc MBA FRCOphth originally trained and practised as an ophthalmologist. In 1994 she retrained as a manufacturing systems engineer with Lucas Industries. Kate spent seven years in management consultancy transferring manufacturing principles to service industries such as banking, airlines and healthcare. In 1999 she rejoined the NHS as a programme manager for the Cancer Service Collaborative. Kate joined the NHS Modernisation Agency in April 2001 and has worked on many NHS redesign programmes. Subsequently Kate has developed the Osprey program (a strategic health authority sponsored initiative training experienced healthcare staff in the skills and techniques required to engineer and design healthcare processes). Kate's specific areas of expertise are in the design and management of organisational systems to improve patient flow across whole healthcare systems and matching the variability in demand and capacity to eliminate queues. Kate has been appointed as an Honorary Senior Lecturer with the University of Warwick.