



*Institute for Innovation
and Improvement*

Going lean in the NHS

Going lean in the NHS

How *lean thinking* will enable the NHS to get more out of the same resources

An introductory guide for healthcare organisations seeking to:

- improve quality and efficiency
- improve patient care and experience
- improve safety and reduce mortality
- reduce length of stay
- reduce waste
- lower costs
- eliminate delays
- improve staff morale



Contents

Lean thinking for better, safer healthcare – with no delays

Five principles of <i>lean thinking</i>	4
How to maximise customer value by eliminating waste	5
Who is a customer?	5
Principle 1: Specify value	6
What's valued / not valued by patients and carers?	6
Principle 2: Identify the value stream or patient journey	7
Value stream mapping enables staff to see waste	7
Designing a better way of working without waste and delays	8
Involving patients	8
Action plan	8
Make someone responsible for the whole patient journey	8
Principle 3: Make the process and value flow	9
Understanding demand	10
Improving A&E	10
Value stream maps to help expose the waste	10
Case study: Hereford Hospitals NHS Trust endoscopy unit	11
Simple tools for better and safer working – the 5S process	12
Pathology lab before and after a 5S activity	13
Standardising processes and the steps within them	14
Principle 4: Let the customer pull	15
Connecting the whole patient journey to improve care	16
Exploiting the pull rather than the push	16
Principle 5: Pursue perfection	17
Helping people recognise when things are going wrong	17
Overview of lean implementation and its advantages	18
Case study: Bolton Hospitals - Better quality plus waste reduction, in days not months	18
Critical success factors	19–20
Case study: Rapid improvement event at Mayday Healthcare NHS Trust sterile services	21
If you're excited about the benefits of <i>lean thinking</i> , here are some points to consider	22

Lean thinking, developed from the Toyota Production System, has been applied in many competitive sectors. Tesco, for example, is one of the biggest and most successful lean companies in the world.

Such thinking is increasingly being applied to health services in the UK and overseas to:

- improve the quality of patient care
- improve safety
- eliminate delays
- reduce length of stay

while using no more resources

Some healthcare organisations in the UK are already obtaining real benefits by the adoption of this approach.

The guide includes NHS case studies showing the principles and benefits achieved.



Lean thinking identifies the least wasteful way to provide better, safer healthcare to your patients – with no delays.

It's about being able to do more with the resources available.

Five principles of lean thinking enhance the quality of healthcare by improving flow in the patient journey and eliminating waste:



Principles	Implications for healthcare
<p>1 Specify value This can only be defined by the customer. Value is any activity which improves the patient's health, well being and experience.</p>	<p>In healthcare we need to identify and agree what value we provide to customers. Anything that improves patient care and experience is adding value, anything else is waste, eg:</p> <ul style="list-style-type: none"> • less waiting and delay • better outcomes • fewer adverse incidents <p>We also need to identify who our customers are. An obvious customer is the patient, however, other customers do exist and need to be considered.</p>
<p>2 Identify the value stream or patient journey This is the core set of actions required to deliver value for patients.</p>	<p>It covers the whole patient journey from start to finish. Identifying which steps add value and improve quality for the patient.</p>
<p>3 Make the process and value flow Align healthcare processes to facilitate the smooth flow of patients and information.</p>	<p>For a patient this means:</p> <ul style="list-style-type: none"> • avoiding queuing and batching • avoiding multiple referrals • removal of all obstacles which prevent the quickest safest practical flow of care
<p>4 Let the customer pull The customer should begin to pull products or services as needed. We should deliver care on demand, with the resources needed for it.</p>	<p>We need to create pull in the patient journey. Every step in the patient journey needs to pull people, skills, materials and information towards it, one at a time, when needed. This means responding to demand, rather than handing off patients and pushing them from one department or ward to another. For example: A ward phoning for the next patient rather than waiting for the request.</p>
<p>5 Pursue perfection Develop and amend processes continuously in pursuit of the ideal.</p>	<p>For the patient this means completing their care and treatment</p> <ul style="list-style-type: none"> • with the best outcome • on time • with no mistakes • without delay <p>To achieve this we need consistent and reliable processes</p>

How to maximise customer value by eliminating as much waste as possible from patient care and NHS services

Waste is anything other than the minimum amount of equipment, space, staff time, which are essential to add value to the product or service.

Who is a customer? An obvious customer in healthcare is the patient. However, other customers exist. A customer is someone who uses something that is made or provided by a previous process step. For example, a ward or the staff on a ward are customers of patients and information they receive from the Accident and Emergency Department.

From a lean perspective there are seven types of waste:

Waste	Description	Health service examples
Correction (Defects)	Rework due to faulty processes Repeating things because correct information was not provided in the first place	<ul style="list-style-type: none"> • readmission because of failed discharge • adverse drug reactions • repeating tests because correct information was not provided
Waiting	People unable to process their work because they are waiting for people, equipment or information	<ul style="list-style-type: none"> • waiting for: <ul style="list-style-type: none"> – patients – theatre staff – results, prescriptions and medicines – doctors to discharge patients
Transportation	Moving materials unnecessarily	<ul style="list-style-type: none"> • staff walking to the other end of a ward to pick up notes • central equipment stores for commonly used items instead of items located where they are used
Overprocessing	Performing unnecessary processing steps that do not add value	<ul style="list-style-type: none"> • duplication of information • asking for patients' details several times • repeated clerking of patients
Inventory	Too much work in progress or stock Information or patients waiting in a queue	<ul style="list-style-type: none"> • excess stock in storerooms that is not being used • patients waiting to be discharged • waiting lists
Motion	Unnecessary people motions, travel, walking and searching Things not within reach Things not easily accessible	<ul style="list-style-type: none"> • unnecessary staff movement looking for paperwork, eg drug sheets not put back in the correct place • storing syringes and needles at opposite ends of the room • not having basic equipment in every examination room
Overproduction	Producing more than is needed, or earlier than needed by the next process	<ul style="list-style-type: none"> • requesting unnecessary tests from pathology • keeping investigation slots 'just in case'

We identify – and eliminate – these various kinds of waste by applying the five principles, as described on the following pages.

Principle 1: Specify value



The first step is to specify **value** to the patient or their carer.

Value is any activity which improves the patient's health, well being and experience.

NHS professionals need to spend time identifying:

- what patients value
- what they want from the NHS

Lean will help cut delays



For example	
Valued by patients and carers	Not valued by patients and carers
Experiencing no delays	Having to wait
High standards and good service	Having their time wasted
Not catching infections while in hospital	Processes which delay recovery, eg: <ul style="list-style-type: none">• missing a procedure because laboratory tests are not available• rescheduled outpatient appointments because staff are on holiday
Being treated in the right place at the right time by the right person	



Principle 2: Identify the value stream or patient journey

The next step is to look at the second lean principle: identify the value stream. There are many value streams involved in treating a patient.

Identifying the value stream means identifying the components of the patient journey which add value to their care. One method of doing this is value stream mapping.

Value stream mapping enables staff to expose **waste** in their processes. Staff involved in the various steps along the patient journey get together to:

- map out how the process currently operates
- identify all the waste and delays, using data

Quantifiable information and actual times are added to the value stream map. This helps staff understand how the process operates. Value stream mapping differs from process mapping in that it maps the flow of information and patients and uses quantifiable information and measurement to build a picture of how the process currently operates.

Once processes are mapped in a visual way, this will expose

- duplicate steps
- unnecessary work
- lack of clear roles and responsibilities



Lean will help to cut out waste



Staff then work together designing a better way of working without all the waste, duplication and delays.



Staff from the endoscopy unit at Hereford Hospital map the endoscopy process and validate their maps.



Staff from preoperative assessment, the Daycase unit and theatres design how they want the process to operate without the waste and delays.

Involving patients in this process ensures the patient perspective is maintained at all times.

An action plan with clear timescales is produced, with a nominated lead made responsible for quickly implementing the improved process.

Immediate benefits often result without major resources being required. Getting staff together and working in partnership is often the most challenging step.

Make someone responsible for the whole patient journey

It is advisable to have someone in your organisation responsible for the whole patient journey from start to finish.

They need the authority to

- remove blockages
- keep patients and information moving

This role could be an extension of an existing role rather than a new one.

For example, matrons could be used to actively manage patient journeys.

For more information on how to do this go to
www.institute.nhs.uk/ServiceTransformation/Lean+Thinking
www.warwick.ac.uk/go/leanhealth

Principle 3

Make the process and value flow

Align healthcare processes to facilitate the smooth flow of patients and information. To do this we need to understand demand for services and avoid batching and queuing.

Contrary to common belief, demand on healthcare processes is mostly predictable within a range. Often it is the way the process is designed and operated that causes any instability.

For example: The timing and numbers of emergency admissions are more predictable than elective admissions.

Instability causes resource bottlenecks and staff stress, and a poor patient experience.

Lean will help cut length of stay



Understanding the type and frequency of demand

We need to 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). They can be grouped together into a separate process.

For example

One of the more effective improvements in A&E departments is to separate the minor injuries from the major and resuscitation processes.

Patients with minor conditions have a huge variety and range of conditions. Yet all require

- a quick simple process to treat them
- experienced and competent staff
- minimal equipment

Processing most patients in under 20 minutes improves the overall time in A&E for the vast majority of patients.

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.



Value stream maps help expose the waste

Value stream maps usually disclose lots of batching and queuing, causing uneven flow through the process, excessive waste and delays. The aim is to make the batch size (the number of patients or tests processed together) as small as possible.

For example

Think how a day surgery unit works. Would it be better to have

- all patients arriving when the unit opens in the morning? or
- a continuous flow of patients at regular intervals

A major benefit from achieving smooth flow is that the status of a process becomes much more visible. It is therefore much easier to see when things are going wrong and make corrections – see case study on next page.

Principle 3

Make the process and value flow – case study

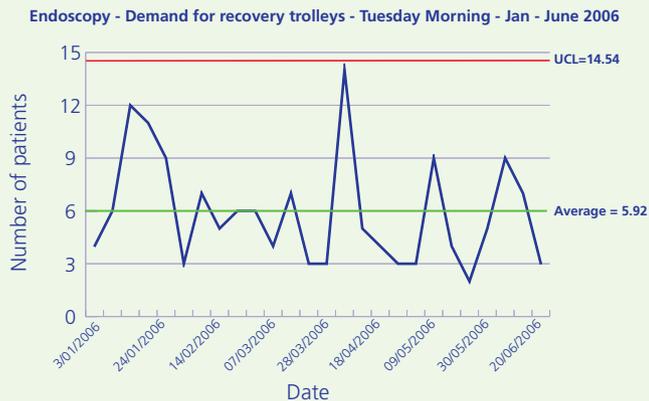
Hereford Hospitals NHS Trust endoscopy unit

Endoscopy unit staff said they hadn't enough recovery trolleys to meet demand.

Once the process was mapped, we realised another activity was occurring – but wasn't included in the value stream. Transfusion patients – not from endoscopy – were occupying capacity at the next process step (six recovery chairs).

The bottleneck was lack of flow through the recovery chairs, **not** variable demand or shortage of trolleys.

The solution was to provide seating elsewhere for the transfusion patients.



Statistical Process Control (SPC) chart showing variation in demand for recovery trolleys

Staff agreed that six patients per three and a half hour session could use one recovery trolley, based on a 30 minute recovery time. The maximum demand (red line) was about 15 patients.

The maximum required was three trolleys, whereas staff previously wanted at least four.

Simple tools create a better and safer working environment

A further tool to improve visibility and make value flow is the simple **5S** process:

- **S**ort
- **S**et in order
- **S**weep & shine
- **S**tandardise
- Finally and most importantly **S**ustain

5S helps create and maintain a clean, safe, high performing workplace. It is an excellent way to engage and motivate staff because it involves everyone.

Implementing 5S creates a more efficient, less wasteful workplace.

5S definitions	Healthcare examples
<p>1 Sort</p> <ul style="list-style-type: none"> • separate what is needed from what is not • keep only what is needed, only in the amounts needed, and only while it is needed • remove unnecessary items – if you haven't used something for months, consider if you really need it to do your job 	<ul style="list-style-type: none"> • sort out and remove old and broken equipment • remove out-of-date stock in cupboards, sluices, store rooms and medicines cupboards
<p>2 Set in order</p> <ul style="list-style-type: none"> • arrange needed items so they are easy to find and use • label items so their store places are easily understood by anyone – a place for everything and everything in its place • make things easy to find and use • sort things, alphabetically, numerically or use photos to enable things to be found quicker 	<ul style="list-style-type: none"> • clear labels and descriptions in store rooms and medicines cupboards • colour-code different types of specimens for pathology • organise files in a logical order in a filing cabinet • sort pharmacy stock in the order of the most frequently used items
<p>3 Sweep & shine</p> <ul style="list-style-type: none"> • create a clean and tidy working environment • remove dirt, mess, clutter and dust from the workplace • keep everything clean and tidy all the time – it's everyone's responsibility to ensure cleanliness 	<ul style="list-style-type: none"> • keep nursing station and ward office clutter-free • maintain the best standards of infection control and hand washing to help prevent MRSA and Clostridium difficile
<p>4 Standardise</p> <ul style="list-style-type: none"> • ensure the first three Ss are being maintained and incorporated into everyday activities • agree and implement standards and procedures for routine tasks 	<ul style="list-style-type: none"> • standardise admission and discharge procedures • have clear roles and responsibilities for staff
<p>5 Sustain</p> <ul style="list-style-type: none"> • make a habit of maintaining correct procedures and continuously improving workplace conditions • sustain the gains so things don't revert to how they were before • regularly measure to see if results are being maintained – correct it the first time you see it, don't let things slip back by ignoring one person who is not following the procedure 	

The following examples demonstrate what 5S looks like:

Pathology lab before and after a 5S activity

Before



Work waiting to go into centrifuge. Various things left waiting to be processed.

After



Centrifuges moved into specimen reception freeing up a whole work area. Workplace cleaned and tidied. Unnecessary equipment has been removed.



Before



Specimens put in a rack then taken to centrifuge, left waiting, unloaded and put in centrifuge.

After



Standardised process:
Specimens put directly into centrifuge carriage. This stops double handling.
Carriages are loaded directly into centrifuge, eliminating 40 minutes of delays per day.

Standardisation (doing things in a set or standard way) also applies to processes and the steps within them

Standard processes

- aid diagnosis of problems
- help in making improvements

because things get done in a standard way every time and staff know their roles and responsibilities.

Standardisation:

- enables more work to be done using the same resources
- helps to reduce variation
- saves time

Principle 4

Let the customer* pull

Every step in the patient journey needs to pull people, skills, materials and information towards it, one at a time, when needed.

So now we have designed a highly visible process or series of processes

- with less variation
- producing less waste
- embracing more standardisation
- with a steady pace of flow

This will have:

- improved patient throughput or productivity
- given staff more time to think and make improvements

Connecting the whole patient journey to improve care

One way of improving patient care is to synchronise the key parts of treatment with patients' needs. Thus they spend the minimum possible time in acute care. Similarly, the resources which support this care should ideally be provided only when and where needed.

This challenges the normal view that resources must be maximised – which often results in much waste and frustration.

Lean will help reduce NHS costs



***Who is a customer?** An obvious customer in healthcare is the patient. However, other customers exist. A customer is someone who uses something that is made or provided by a previous process step. For example, a ward or the staff on a ward are customers of patients and information they receive from the Accident and Emergency Department.



Exploiting the pull rather than the push

Many healthcare processes are based on push rather than pull. Patients and information are often passed on regardless of resources and capacity available at the next stage along the patient journey.

The NHS needs to design patient journeys so that patients are pulled through processes based on demand. Discharge needs to pull patients from wards, wards need to pull patients from A&E, admissions units and theatres while pulling support from pathology, radiology or other departments as needed.



For example

A&E patients who need a bed are typically pushed to a ward.

A&E staff have to spend time searching for a suitable bed in the hospital. This involves a lot of coordination and many people.

If the pull concept is applied, the admitting ward pulls patients from A&E when a bed is available. They don't wait for A&E to ask for a bed.

This approach:

- cuts delays
- increases productivity
- saves time and money
- speeds up processes
- reduces length of stay

It does require good communication and robust agreed procedures to work efficiently.

Once pull is adopted, with resource allocated to match, flow improves and resource use increases.

Principle 5

Pursue perfection



Develop and amend processes continuously in pursuit of the ideal. The final step in lean implementation is to pursue perfection by further

- reducing mistakes
- eliminating delays and waste
- finding better ways of providing value to patients



Lean will help cut waiting times

Perfection comes from a continuous stream of small improvements generated by staff over time. But it's hard to achieve sustainable improvements in an unstable environment. So the first four principles aim to provide a more stable environment from which to improve. Those early steps aid understanding of the processes within a value stream, making them visible and exposing obvious waste.

This helps people recognise when things are going wrong, so they can eliminate waste and make the value flow, by

- standardising processes
- introducing steady methods of working to reduce peaks and troughs

Finally, we move to pulling value through this process, helping ensure the right resources are available when needed. The usual result is greatly improved processes with much less waste and a calmer work environment. In this stable situation, getting and sustaining ongoing improvement is much easier. Importantly, everyone can contribute at any time.

Overview of lean implementation and its advantages

A lean organisation realises that improving quality and safety results in more efficient and cost-effective care.

Focusing on waste reduction cuts costs

Lean thinking and its associated tools help organisations to identify:

- how work gets done
- how to eliminate waste and confusion in processes

Focusing on eliminating waste will help cut costs. It adds value to your processes, improves flow, eliminates ineffective effort and maximises the value to patients. This requires a shift in thinking about how we manage and run NHS organisations.

Benefits can be substantial, including:

Patient flow improved	Waste reduced	More patients treated
Patients treated faster	Shorter waiting times	Safer, more reliable services
Best use of capacity	Reduced length of stay	Standardised procedures and equipment
Cost savings	Increased productivity	Improved staff morale

Lean organisations are efficient, organised and provide high quality services

A lean organisation is:

- capable of providing the highest quality services and products
- results and patient focused
- efficient
- extremely well organised
- a great place to work

There is an ongoing improvement commitment from clinical and managerial leaders to ensure improvements are sustained. Lean is not a fad or a quick fix solution.

Case study: Better quality plus waste reduction, in days not months

Bolton Hospitals NHS Trust started applying a lean approach in summer 2005. They aimed to *improve the non-elective trauma patient pathway* after previous improvement approaches had failed.

In July 2006, the following outcomes were realised from the lean approach:

- 50% reduction in hospital mortality for older patients with a fractured neck of femur (validated using Jarman criteria)
- 37% reduction in overall mortality for adult trauma patients
- 32% shorter length of stay. No patients were transferred to the long-term rehabilitation ward after the *trauma stabilisation* unit opened in August 2006

The above improvements were made using less resources than previously required.

In August 2005 the *trauma stabilisation* unit implementation team achieved a 30% reduction in time from admission to theatre. The average of 2.5 days fell to 1.7 days for complex adult orthopaedic trauma patients.

Critical success factors

NHS staff have the capability and need senior leadership support and encouragement.

Applying *lean thinking* requires few outside experts. The NHS must develop its *existing* service improvement capability. The emphasis in a lean organisation is first to learn by doing, then train staff as required. They may need guidance on using specific tools and techniques, and some coaching to help them. But mainly they need *empowering* to do the work.

Support by leaders and their commitment to providing necessary resources and training are critical for a successful lean culture. They are key to enabling staff make the improvements required, by removing the organisational barriers, perceived or actual.

1 Small changes make a big difference

Lean encourages and empowers staff to make small improvements to their daily job. You don't always need a project team to get results which have a big impact. Often, staff merely need permission to improve.

For example, a common problem is that clinicians spend a lot of time searching for prescription pads. At the Heart of England Foundation NHS Trust, over 100 prescriptions per day are written in the emergency department. Previously it took at least two to three minutes, and sometimes a lot longer, to find each prescription pad. That's at least 200–300 minutes per day wasted searching for pads.

A simple and quick change was made. A member of staff simply taped a pad to the desk in the doctor's office. Staff now know where to go to find the pad. This saves valuable time.

2 Lean benefits maximised by involving all staff

To obtain the full benefits and ensure improvements are sustainable requires an organised and supported ongoing programme at all levels. Significant benefits are seen when lean is implemented across all the flows within the healthcare system.

3 Lean will help motivate staff, and save time and money

Most people, both administrative and operational, find the lean journey personally rewarding and corporately beneficial. Lean is inclusive and motivational because it encourages a problem-solving culture where everyday problems and frustrations are quickly resolved.

Staff will save an enormous amount of time and effort which can then be used more effectively. **The decision to go lean could make the difference between your organisation being financially viable or not.**

4 Executive support is essential for success

Lean implementation must be led from the top as part of your strategic plan. The vision must be set by the board and should inform your operational plans.

All leaders must create the environment where applying lean thinking can deliver results. This includes giving people time and space to contribute. All leaders should spend time in the workplace just observing and listening to staff and patients. They will then see the waste, the associated cost and the lack of flow of patients and information.

Many staff will have been patients or carers and they will see processes from a different perspective. We should take advantage of this perspective.

For improvements to be sustainable, front line staff must be actively involved in identifying problems, and responsible for implementing solutions. The role of senior staff is to **enable** staff to implement the solutions, not to undertake the change.

5 Dedicated lean support builds quick results

To facilitate improvements and get quick results, it's advisable to have dedicated lean trainers available. They can be internal or external. Many organisations can help here, though few have health service experience. Only NHS staff know what's possible once such tools and techniques are understood and deployed.

Lean implementation teams and individuals require active support in overcoming possible blocks to introducing new or modified processes. Nothing succeeds like success, so it's good practice to start by examining specific value streams, with willing participants. For example, the value streams for:

- daycases
- emergency long-stay patients
- elective short-stay patients
- respiratory disease in the community

NHS organisations need to identify their value streams, then design new processes for patients and information flowing through them.

6 Rapid improvement events for results in days, not months

Rapid improvement events are usually a three to five day activity, and can be very effective. Representatives from a value stream work together to solve a particular problem, focusing on quick wins. *Lean thinking* on specific processes will eliminate waste and improve effectiveness, often improving the patient experience **and** reducing staff frustration. See example overleaf.

A good example of a rapid improvement event at Mayday Healthcare NHS Trust:

Case study: Mayday Healthcare NHS Trust sterile services

Sterile services supplied over 3000 packs of sterilised instruments to theatres. Despite much overtime, packs were often unavailable when required, and 40% had shortages. Everything was therefore urgent and theatres had to run Saturday lists to meet demand.

The conventional answer was more staff and more sterile packs. A team spent five days applying the first four lean implementation principles, with facilitators from South West London Improvement Academy. This resulted in a six week implementation plan for a better way of working:

- the flow in sterile services was improved, giving more consistent turnaround times for packs and better availability
- less time was lost preparing theatre lists
- demand was smoothed throughout the day
- theatre lists were carried out to plan, without overtime or further resource

Everybody's job was made easier. The effect on the demand pattern to sterile services is shown below as one of the benefits obtained.

The red line shows the packs arriving at sterile services and the blue line the number leaving theatre.



Demand and capacity for sterile services. Peaks and troughs have been smoothed out. Most work now arrives in the morning rather than late afternoon, giving staff more time to process the sets.

If you're excited about the benefits of lean thinking, here are some points to consider

Many of the initial benefits come through improving quality and reducing delays, which will increase capacity. Savings will follow.

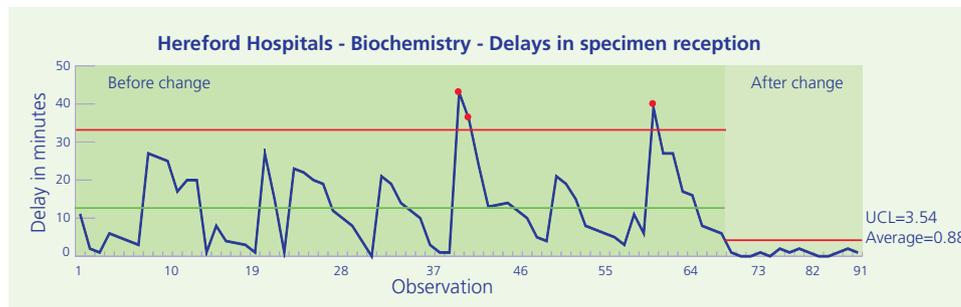
1 Teams need to decide how to use extra capacity to improve quality or boost income. Otherwise it adds cost but no value. The alternative is to think about reducing capacity in their organisation. That's why strong leadership is required for this approach. Lean it is not a quick fix solution, it is a long term strategy.

2 Lean thinking requires action on several value streams before bottom line benefit is obtained. It is essential for success that management is seen to support the approach. They must demonstrate their commitment is long term, not *'just another initiative'*. This requires a vision of the possibilities and willingness to experiment.

3 Engaging people involved in the processes is crucial, including clinicians where patients are concerned. They must be given space to try new things. It took Toyota several years to develop the processes which got them where they are today and they have developed a culture of always aiming to make things better, faster and constantly lower costs.

4 Get quick results and savings:

Metric	Before change	After change	Improvement	Savings
Turnaround time (from receipt to results available)	62 minutes up to 2 hours	38 minutes	40% reduction	Equivalent to 2 beds a day A&E targets met



93% reduction in delays in specimen reception in pathology achieved in 7 days.

5 Develop and grow a NHS lean culture

We need to develop and grow our own version of lean that works for the NHS. We can't just copy what has worked in another sector, though we are lucky we can learn from their experience. We should use the approaches they developed to move NHS organisations forward much faster.

Sources of more information

For more information, resources, case studies and help on how to implement lean go to www.institute.nhs.uk/ServiceTransformation/Lean+Thinking and www.warwick.ac.uk/go/leanhealth

Authors

Neil Westwood – *NHS Institute for Innovation and Improvement*

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

Mike James-Moore – *The University of Warwick*

Mike James-Moore has been involved in lean transformation since 1980 when he was Director of Industrial Engineering at several car manufacturing companies. As a fellow at Warwick University Mike has been the academic coordinator of the Lean Aerospace Initiative research programme which is estimated to have saved the industry £60 million per year.

Professor Matthew Cooke – *Heart of England NHS Foundation Trust and The University of Warwick*

Matthew Cooke is Professor of Emergency Medicine at Warwick Medical School and Heart of England NHS Foundation Trust. He works with university colleagues in manufacturing and business to study the implementation and application of lean and other improvement techniques for healthcare. His interest in lean started with his national role in the Reforming Emergency Care agenda.

Call to Action

Important: your feedback is required as part of the continuous improvement process.

We are seeking lean examples from all NHS organisations. If you have any to share please send to email below.

We need you to tell us if this document has conveyed its thoughts clearly enough to you. Equally important are any shortcomings you discover, or factors which need adding to or improving.

Please contact Neil Westwood on neil.westwood@institute.nhs.uk

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