



NHS Cervical Screening Programme (NHSCSP)

Cytology improvement guide - achieving a 14 day turnaround time in cytology

*"Clinical excellence in partnership
with process excellence"*



the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million (19.5% of the population).

There are a number of reasons why the number of people aged 65 and over has increased. One of the main reasons is that people are living longer. The life expectancy at birth in the UK has increased from 72 years in 1950 to 77 years in 2000. This is due to a number of factors, including improvements in medical care, better nutrition, and a healthier lifestyle.

Another reason why the number of people aged 65 and over has increased is that people are having children later in life. This is due to a number of factors, including the fact that women are having children later in life, and the fact that men are having children later in life. This is due to a number of factors, including the fact that women are having children later in life, and the fact that men are having children later in life.

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1. Foreword



Professor Mike Richards CBE
National Cancer Director

The NHS Cervical Screening Programme (NHSCSP) is undoubtedly a major success. Over the past two decades the NHSCSP has led to many cancers being prevented and has led to significant reductions in the death rate from cervical cancer in this country. It has been established that cervical screening saves around 4,500 lives every year in England.

Much of the success of the NHSCSP can be attributed to having effective call and recall systems and quality assurance schemes.

The introduction of liquid based cytology over the past few years (2003-2008) has led to significant reductions in the number of 'inadequate' tests (from around 9.5% to 2.5%). This means that around 400,000 fewer women need to be re-screened each year.



Professor Julietta Patnick CBE
Director NHS Cancer Screening Programme

However, we know that we can and we must do better. In many parts of the country women are having to wait far too long to receive their test results. By December 2010, all cervical screening services have to ensure that women receive their results within two weeks of the test being done.

Pilot sites working with NHS Improvement have demonstrated that the 14 day standard for cervical cytology can be achieved and that this brings benefits both for the patient and for the NHS in terms of potential cost savings.

This guide shows how the 14 day standards can be achieved. We commend it to all commissioners and providers of cervical screening services.



Professor Mike Richards CBE
National Cancer Director



Professor Julietta Patnick CBE
Director NHS Cancer Screening Programme

2. Executive summary

The publication of the Cancer Reform Strategy (Nov 2007) made a promise to 'ensure that all women receive the results of their screening tests within two weeks by 2010'.

The Scharr report (Feb 2006) highlighted that with minimal investment it was possible to deliver the service to 50-66% of women within seven days with the remainder receiving their result within 14 days.

In 2006 the Review of Pathology Services in England by Lord Carter endorsed Lean as the method of choice for improving processes in pathology services. Working in partnership with the National Cancer Screening Programme, NHS Improvement supported 10 pilot sites to test the Lean methodology to demonstrate how to deliver a two week service.

The approach involved bringing multi-disciplinary teams from primary care, laboratories and recall agencies together to work collaboratively on the whole pathway. Staff were trained in Lean methodology, applied the learning, redesigned their own service and delivered significant improvements.

Over **500,000** women will have benefited from the improvements in:

Turnaround times: 100% of women receiving their result within 14 days (for most sites) and over 80% of women receiving results within seven days for five out of ten sites.

Quality and safety: Implementing a zero tolerance of defects in request forms and sample labelling to reduce errors.

Innovation: Using simple visual management techniques to improve flow, safety and productivity.

Productivity: Eliminating non value added steps, ensuring appropriate utilisation of workforce, demonstrating the capacity required based on the demand, and ensuring technology is used effectively.

Key learning has demonstrated success is achieved through:

Strong and proactive clinical and managerial leadership: To encourage, drive, motivate and empower staff.

Collection and analysis of appropriate data: To understand the current end to end pathway.

Walking the pathway: Go to see the problem first hand.

Executive support: To provide active support and remove barriers.

Empowered staff: Who own the problem, find the solutions and 'stop to fix'.

This guide provides clinical teams with the basic tools to make changes to their processes, and is supported by tried and tested case studies from across the whole pathway.

3. Introduction

As the 14 day target is of national importance, there will naturally be a great deal of interest in how Lean methodology has been used to support the aims of the Cancer Reform Strategy.

Over the past four years NHS Improvement has worked with a number of pathology teams to test and prove the value of Lean methodology. Clinical teams have been extremely successful and the methodology is being widely adopted in many pathology laboratories and other clinical settings across the country.

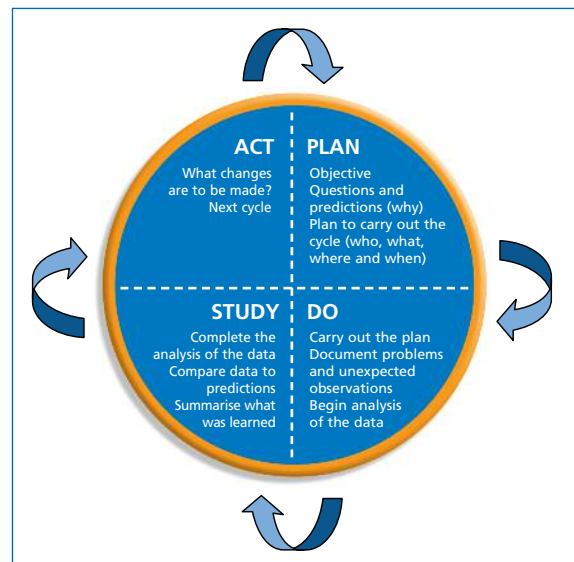
The methodology and approach was further endorsed by Lord Carter in the 'Report of the Review of NHS Pathology Services in England' in 2006/2008.

Pilot site teams were trained to:

- Understand and identify waste.
- Apply Lean principles to improve flow.
- Use PDSA cycles (plan, do, study, act) to test out ideas to ensure changes make the improvement required before implementation (sometimes known as PDCA - plan, do, check, act).
- Use data to demonstrate the impact of improvement.
- Understand how people respond to change;
- Use statistical process control charts (SPC) and root cause analysis.
- Understand communication methods and work as part of a team.

To further support and embed the improvement methodology within the local environment and create local ownership, an overview of Lean methodology was provided for all staff involved in the pathway.

The training, combined with clinical lead commitment, are essential to the sustainability of achieved and ongoing improvement.



Spreading and sharing the learning

Networking amongst clinical teams involved in the pilot, facilitated a collaborative approach to achieving improvements and to spreading innovation and success.

A buddy system for close locality sites was set up to support the sharing of best practice along with a series of training and development workshops and shared learning events.

In addition, a number of regional learning events were conducted by pilot site teams, supported by NHS Improvement National Improvement Leads to spread some of the learning to non-pilot sites.

This document contains case studies from the phase one pilot sites to help illustrate the changes made. Further case studies can be found on the website at:

www.improvement.nhs.uk/diagnostics

4. Phase one pilot sites

The following sites were selected by the National Cancer Screening programme to take part as phase one pilot sites. One of the criteria for joining the programme as a pilot site was to become exemplar sites, prepared to share learning with other teams.

Clinical teams will benefit from visiting the following phase one sites, where they will observe Lean methodology as part of everyday working and learn how the targets have been achieved.

The criteria for inclusion as an exemplar site are:

- Delivery against 14/7 day target (min. 95% and 50%).
- Clear evidence of Lean methodology including:
 - Visual management
 - Standard work
 - A3 problem solving
 - Stop to fix problems via daily meetings
 - 5S.
- Evidence of all staff committed to continuous improvement and Lean methodology.
- Evidence of sustainability and committed leadership.

The phase one pilot sites are:

Leeds PCT and The Leeds Teaching Hospitals NHS Trust

Lead: Dr Simon Balmer

Hull Royal Infirmary and Hull and East Riding PCTs

Lead: Ms Kathleen Young

Pennine Acute Hospitals NHS Trust

Lead: Mr Tom Wilson

Norfolk and Waveney Cellular Pathology Network (Norfolk and Norwich University Hospital NHS Foundation Trust)

Lead: Dr Xenia Tyler

West Anglia Pathology Cytology Laboratory (Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital and Anglia Support Partnership)

Lead: Ms Roseanna Bignell

Barts and The London NHS Trust

Lead: Mr Geoffrey Curran

Somerset and West Dorset Cervical Screening Service (Taunton and Somerset Hospitals NHS Trust)

Lead: Dr Simon Knowles

Ashford and St Peter's Hospitals NHS Trust

Lead: Mr Behdad Shambayati

North West London NHS Trust (Northwick Park Hospital)

Lead: Dr Tanya Levine

Central Manchester University Hospital NHS Foundation Trust

Lead: Dr Mina Desai

5. Learning for future improvement

The purpose of this document is to share the learning from phase one pilot sites. It makes recommendations for change through evidence based case studies and encourages teams to adopt the learning, adapt within their own service, and visit exemplar sites to discuss improvements made, challenges faced and pitfalls to avoid.

The four key changes have been identified which will bring about substantial reductions in end-to-end waiting times for the cervical cytology pathway are:

1. Focus on the whole end to end pathway:

- link all staff across the pathway;
- use whole pathway data to understand where samples and reports are waiting.

2. Adopt small batch sizes:

- throughout the entire pathway, including the prep room, lab, screening room, data entry as well as primary care and the call/recall agency.

3. Keep samples moving:

- daily delivery from primary care;
- pull work through the lab;
- multiple daily downloads;
- daily issue of reports.

4. Establish first in, first out:

- no prioritisation of samples;
- today's work today.

The key mechanisms required to achieve these changes are:

1. Empowered staff who can:

- see the waste and remove it;
- test changes through PDSA cycles;
- have information to say how we are doing;
- use suggestion boards to have ideas actioned.

2. Daily meetings established to:

- stop and fix problems;
- encourage a culture of daily problem solving.

3. Visual management techniques to:

- display performance data;
- promote standard work;
- ensure safe working practices.

4. Information to support the process:

- turn real time data in to information to manage the process;
- ensure visibility of efforts;
- identify problems and establish mechanisms to solve problem;
- encourage root cause analysis.

To accelerate the pace of change to reduce turnaround times, defects and rework and improve quality, safety and productivity, teams should consider applying:

- **Just do its** – tried and tested, proven to reduce turnaround times – adopt as many as you can;

and consider the;

- **Human dimensions of change** – the importance of engaging all staff.

An engagement survey tool is available on the NHS Improvement website.

Whilst this process will not be easy, the rewards are great!

6. Understanding where you are

Measuring the end-to-end pathway

At the launch stage of a project, it is important to create an understanding of what is actually happening, as distinct from what 'should be' or is thought to be happening. Identifying the current situation should include the whole journey of the samples – not just in-laboratory processes.

The best way to do this is to 'go see'. This means to physically walk the whole pathway and produce a photographic record of the process. It is recommended that this is done by the whole core team to ensure objectivity.

The pathway should then be graphically represented as a current state value stream map. Measurements taken as part of value stream mapping will provide the baseline against which the impact of any changes to the process can be compared.

Every task undertaken while processing samples will have an impact on achieving the 14 day turnaround time (TAT) and should therefore be included in baseline measurement. TAT is defined as the time the sample was taken to expected date of delivery of the result letter to the woman.

Data requirements

To capture a clear and accurate TAT measure, data should be collected for all three key stages of the cytology pathway:

1. Date sample taken to date sample received in the laboratory specimen reception.
2. Date specimen received in specimen reception to date report authorised and sent to the recall agency.
3. Date report received in the recall agency to date result received by woman (calculated by adding one day to the date letter issued for first class postage or three days for second class).

To determine the impact of changes made in the laboratory or other specific parts of the pathway, additional timings should be captured and statistical process control (SPC) charts produced to evidence achieved improvements.

Recommendations include:

- Date/time primary screened
- Date/time rapid review performed
- Date/time report authorised
- Date recall agency received info (down electronic link),
- Date letter was issued.

A sample data collection spreadsheet can be found on the NHS Improvement website.

Note: it may be appropriate to record measures for all test results (abnormal, negative, incomplete) separately so these can be monitored individually.

What type of data and how much?

We recommend you collect data on at least 750 consecutively numbered specimens taken in the same week to provide a statistically valid baseline TAT.

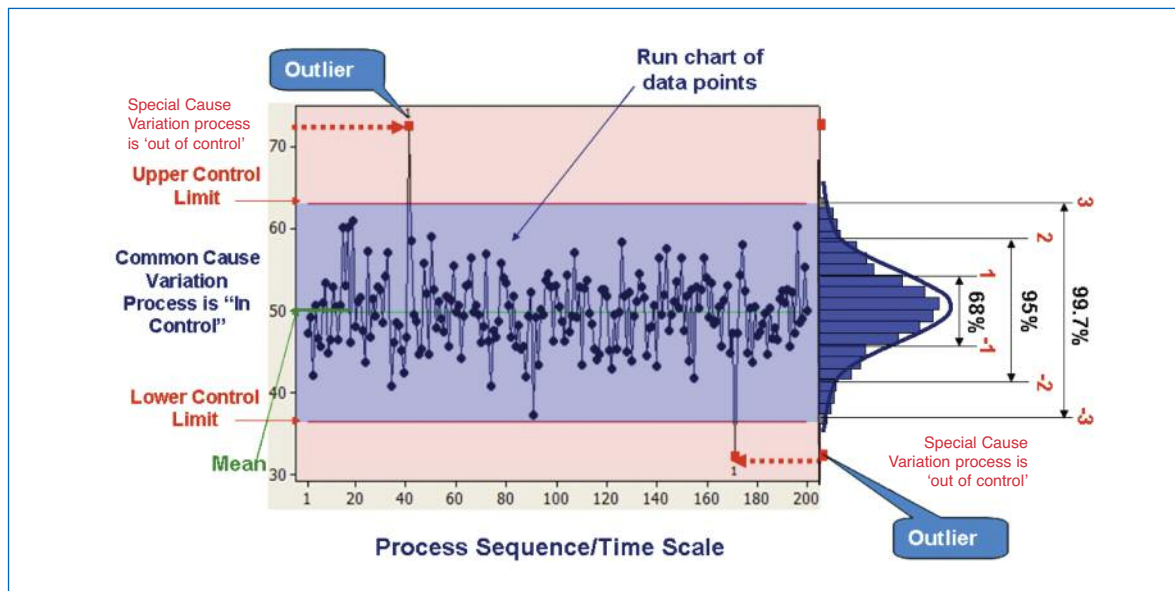
Calculating and monitoring TAT - Using statistical process control (SPC)

By collecting data from samples at the three key stages within the pathway, variations in delay/wait times and other sources of waste can be detected, corrected and tracked to assess how/if these are reduced over time as a result of improvement changes.

SPC charts provide a graphical representation of the time it takes to process a particular sample and an overall view of the variation in the process.

Statistical control limits are calculated from the data input and are displayed on the chart along with process average (mean) and its variation about that mean. If there is evidence of unusual variation or 'special cause' (outlier) detected, then this 'special cause' should be investigated by using a root cause analysis technique (see section 13).

SPC tools can be accessed via the NHS Improvement reporting system or NHS Improvement excel data template. To find out more about SPC and the types of 'run rules' that are used to indicate out-of-statistical control situations please refer to the website or NHS Improvement publication '*Bringing Lean to Life - Making Processes Flow in Healthcare.*'



Your individual project can be set up on the NHS Improvement reporting system and this will enable you to track the project, add project documentation and upload improvement stories. Further information on how to use the NHS Improvement System can be obtained via support@improvement.nhs.uk

Other important data for your baseline

Turnaround times

% achieved in 14 days

% achieved in 7 days

Quality and safety (defects)

% samples/forms with inaccurate/illegible/incomplete information

% referrals returned to requester

% reports authorised and sent to recall agency which required manual matching

Engagement

Overall engagement scores at start of project and various additional points throughout the change process.

Skyline plots

The East of England Screening QA Reference Centre (QARC) has developed a cervical screening system enquiry that recall centres can use to perform a patient based search that will show TATs in a bar chart.

The query covers date sample taken through to date added to recall system. It shows patient identity to enable root cause analysis for samples that have taken longer than 14 days for analysis and result return. An additional field of 'expected date of delivery' is due to be added to the query shortly so full end-to-end TAT can be produced.

This query can be run by all recall agencies for any specified time period, allowing analysis of data on daily, weekly or monthly cycles. The data can be sent to laboratories via secure transfer (or can be run without patient identifiers) and together with laboratory sample data can be used as an alternative to SPC charts.

Instructions on how to run this query can be found at: www.improvement.nhs.uk/diagnostics

In addition, each individual laboratory can run this query through CYRES. It should be remembered that this will only show from date sample received to date results sent to recall agency. Ensuring a 14 day end-to-end TAT will require all samples to be within 10 and 12 days depending on time taken by recall to send letters out.

7. Self assessment

The Endoscopy Global Rating Scale (GRS) and Radiology Service Improvement Assessment Tool (RSIAT) were developed by the Endoscopy and Radiology service improvement teams respectively and have been used widely since 2004 to benchmark these diagnostic services and provide teams with a focus for improvements. They have been designed to allow clinical teams to see which areas they need to concentrate on to achieve the cancer waiting times targets.

Whilst such a tool for cytology is currently still under development, the questions, and answers teams provide, can help to steer the focus of improvement in the direction that will create the most benefit to the screening programme.

The questionnaire can be found on the NHS Improvement website at:
www.improvement.nhs.uk/diagnostics

8. How to begin

Team guidance

Firstly, identify a credible and respected project lead to head up the team. This could be a clinician or manager with the drive and enthusiasm to steer changes across the whole pathway. N.B. full screening programme pathway includes colposcopy and histology:

Project team members should be drawn from across the entire pathway:

- Clinical /managerial lead who must provide active support and leadership to the core team
- Primary care – (e.g. PCT lead, practice manager) should be able to contribute to discussions such as organisation of transport for same day sample delivery
- Laboratory – (e.g. MLA, BMS, AP, screener) must represent and understand specimen reception processes and the laboratory LBC and screening process (you may wish to co-opt a laboratory manager and/or histopathologist onto the core team/wider team or steering group)
- Results issue agency – should be able to contribute to discussions and influence / lead changes to the results issue process
- User involvement – member of an existing gynaecology patient group or suitable equivalent, likely to be a wider team member
- Colposcopy – a member from this area may be co-opted onto the wider team / steering group.

Core team members must:

- Understand the process within their stage of the pathway
- Be able to contribute ideas/information on the process
- Be able to influence the decision making process
- Be prepared to test and implement changes across the pathway
- Be committed to attend all team meetings, conference calls and sharing events.

Wider team membership/steering group

It is recognised there will be a wider team of individuals who are key stakeholders across the pathway who will provide managerial and strategic support but may not be a member of the core team for training.

Executive support

An executive team sponsor should be identified to provide proactive support and access to relevant support services such as estates, transport, HR, finance and IT teams. They may be called upon to escalate key issues.

Protected time out

This is essential to allow thinking time for the core team and any members of staff planning a plan, do, study, act (PDSA) cycle and may have to be facilitated by the departmental manager or executive lead

Communication plan

It has been widely recognised from the phase one pilot sites that the establishment of a communication plan is essential and a central information board should be positioned to inform all staff of project activity and progress.

Training location/work room

Space will be required for the core team to work. An area should be identified where local training can take place and where teams will have space to work on projects and store information work sheets/maps with easy access to these items on a regular basis.

9. Establish the measures

Identifying and measuring factors which impact overall turnaround time

In addition to the global measure of turnaround times (TAT), quality, safety and staff engagement, there will be other local measures and quality indicators that can be used to assess the impact of the project.

These should be focussed around:

Safety - reducing avoidable harm and creating confidence that the result is accurate e.g. no errors in sample taking, request cards, data input or results letters.

Customer experience - understanding of the result with relevant and timely information e.g., information at time of test and with result letters.

Effectiveness of care - good quality outcomes e.g. no unplanned staff/machine/system downtime and each result produced within PCT tariff.

Some examples of additional measures:

- Patient satisfaction rating;
- % processor/system utilisation;
- % staff availability;
- % inadequate/re-prep samples;
- % machine/system re-runs;
- % of samples with insufficient cells;
- % staff absence;
- Stock level replenishment;
- Number of unplanned shutdowns v. target;
- Department productivity v. target.

10. Just-do-its (JDIs) - recommended immediate activities

This section is designed to help teams make some very quick changes. These have been tested and proven to make a significant difference to turnaround times.

Most are simple, quick to do, with very little effort required.

All parts of the pathway are covered. Changes should be implemented in a planned and

structured way, guided by the core project team and project lead. Measures should be in place to track improvements.

To support the JDIs, the case studies demonstrate how sites have implemented some of these simple changes evidencing the improvements achieved.

Primary Care		
	Action	Why?
1	Enforce a policy for refusing 'out of scope' samples and ensure GPs and sample takers know the correct pathway for symptomatic patients.	Stop inappropriate sample testing and inappropriate samples being tested when a more suitable test/intervention is required.
2	Send samples to laboratory daily, even if there is only one!	To ensure timely testing.
3	Ensure appropriate staff are trained in use of 'Open Exeter' and are able to use the system to its full capability.	To enable the correct information to be put onto the request form regarding the last cytology results etc.
4	Always use pre-populated HMR101 forms or print offs from the primary care system.	To ensure correct demographics are recorded. Samples are not returned for correction or because hand writing is illegible.
5	Where available – use electronic requesting for every sample.	To ensure correct demographics are recorded. Samples are not returned for correction or because hand writing is illegible.

Laboratory		
	Action	Why?
1	Reduce batch sizes to a maximum of 20 in the prep room.	Although instinct tells us batching 'feels' quicker, this will immediately reduce your TAT. Use SPC to evidence the gains.
2	Reduce batch size to 10 or less in screening room and office area.	Although instinct tells us batching 'feels' quicker, this will immediately reduce your TAT. Use SPC to evidence the gains.
3	Reduce batch size for consultants to a maximum of four.	Although instinct tells us batching 'feels' quicker, this will immediately reduce your TAT. Use SPC to evidence the gains.
4	Implement a non-acceptance policy for incorrect forms/vials.	Eliminates time spent by staff dealing with omissions and mistakes, logging returns, telephoning surgeries etc.

Laboratory (continued)		
	Action	Why?
5	Implement 'quiet time' in the screening room during an agreed period each day (no answering e-mails, remove the fax machine, mobile phones set to silent).	This will improve the quality of concentration and productivity of the screeners.
6	Introduce a staff ideas and information board.	Important to engage staff in identifying issues and solutions. Essential to provide a feedback loop explaining what is happening with suggestions made.
7	Initiate five minute daily meetings (huddles) with all staff around the information board.	Encourages 'stop to fix it' culture and improves engagement. Staff know what is expected of them and how the team is progressing
8	Introduce visual management showing numbers of slides/samples in (demand) and numbers out (screened) daily.	Improves productivity. Progress is visible and motivating.
9	Stop over labelling or writing patient names on slides.	Will remove an extra step and improve safety which could be compromised by potential labelling errors.
10	Stop the process of slide matching in the prep room. Ensure all slides and forms are kept in numerical order in the same batch sizes. When required, screeners collect one tray of slides and the corresponding batch of request forms before screening.	Saves staff time and frees up space. Reduces TAT.
11	Implement standard work in screening - screening one tray of 'primary' followed by one tray of 'rapids'.	Prevents slides waiting overnight or over weekends for rapid review. Saves BMS time allocating slides.
12	Promote the use of pre-populated HMR101/primary care system forms or order comms.	Prevents defects / mistakes on forms.
13	Set up multiple daily electronic downloads to the recall centre – at least twice daily if IT systems allow. Check what can be done – don't assume it isn't possible!	If sent weekly – could save up to save seven days off TAT. If sending download daily - Will save one day for half your screening output each day.

Recall agency		
	Action	Why?
1	Implement first class post for all results letters.	Can save between two to seven days on TAT.
2	Post results letters every day, Monday to Friday.	Will save a minimum of five days on TAT.
3	Remove the lab and recall telephone number from results letter, add NHS Direct telephone number.	Prevents unnecessary phone calls to the laboratory and recall centre who then have to refer back to the GP.
4	Receive numerous electronic daily downloads from the laboratory – at least twice daily.	Will save one day for half the screening output each day.
5	Contact all recall agencies you forward results to, ensure they are aware of their role in delivering 14 day target.	14 day target is: Date sample taken to expected date of delivery of result to woman. A result to the wrong recall agency, will need time to send to correct agency – the clock is still ticking.

All areas		
	Action	Why?
1	Initiate monthly meetings with the laboratory, recall agency, commissioners, primary care representative etc.	To improve communication and resolve any cross boundary issues.
2	Send out monthly reports and newsletters communicating current TAT, achievements, issues etc.	To improve communication, promote your project and the national target and manage customer expectations.

Case study 1

Reducing batching in the screening room

North West London NHS Trust

Summary

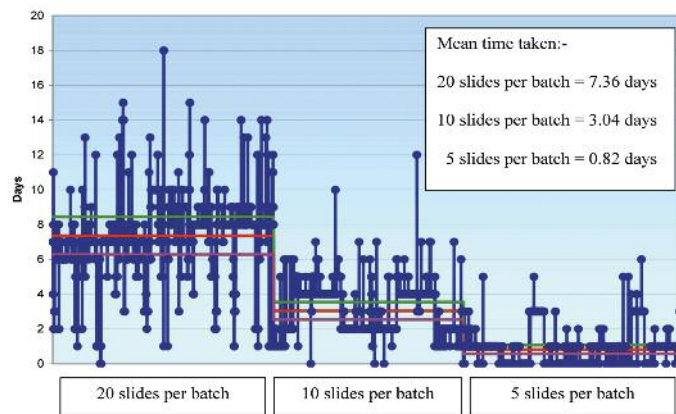
Changes made in cytology screening room to reduce waste caused by batch processing through the screening process.

Understanding the problem

The need to reduce the length of time spent waiting for something to happen:

- Watching the progress a case made during its journey through the cytology screening room identified numerous occasions where the case would simply sit and wait amongst a batch until the next stage of the process could take place.
- Backlogs were seen with slides waiting to be primary screened, rapid reviewed, checked and reviewed by the pathologist.
- Slides were done in batches of 20 as this was the number of spaces available on the slide tray.
- Screeners would not always take a tray of rapid review after completing a tray of primary screening which would result in an increased number of cases awaiting rapid review.
- Some screeners would put their results on the computer only after they had completed a tray of slides and not immediately after screening the case.
- It was common practice for a screener to leave an uncompleted tray of work on their desk where it would remain until they returned to work.
- Data recorded included the date and time when each stage of the process took place. This data was extracted from the computer by use of a specially written computer programme and then manipulated in Excel and analysed using SPC charts. A numerical assessment as to what the backlog was at the various stages of the process was also kept.
- Slides requiring checking or pathologist review were allowed to build up.
- The principle type of waste identified was waiting.

Effect of reduced batching of slides on length of time taken from booking in to primary screen



How the changes were implemented

- Batch sizes of slides reduced to 10 per tray.
- Policy imposed that a screener completing a tray of primary screening must then take a tray of rapid review.
- Cases to be reported on computer immediately after screening.
- No work to be left on desk at end of working day. Any uncompleted screening must be returned to the pool of work.
- Checkers to be more pro active in doing checking to prevent build up cases.
- Work requiring pathologist review to be allocated to named pathologist
- Eight months after the above changes were implemented the batch size of slides per tray were reduced from 10 to five.

Measurable outcomes and impact

- Since the implementation of the reduced batching procedures within the screening room there have been marked reductions in the length of time cases take from when they are booked in to being verified.
- Changes instigated at the time of reducing the number of slides per tray from 20 to 10 resulted in a one day reduction in primary screen to verification TAT.

- The move to reduce the batch size down further to 5 slides per tray resulted in a further 20% reduction in primary screen to verification TAT.
- The effect these changes have made can be clearly seen on the SPC chart below which displays the length of time taken from the booking in of the case to the time it is primary screened.
- The reduction of batch sizes has had the effect of pulling the work through the department.
- The reporting rates for abnormality has remained constant during this time.

Ideas tested which were successful

Improvements in turnaround time were seen wherever batching was reduced or eliminated.

How this improvement benefits women

Improved TAT without reduction in quality.

How will this be sustained/potential for the future/additional learning?

Reduced batch size has become the normal practice within the department. Further reductions in batch size may be tried but we are not sure this will produce further reductions in TAT.

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Case study 2

Introduction of multiple downloads

The Leeds Teaching Hospitals NHS Trust

Summary

32% of result letters are received by women a day sooner than before with a further 8% being received three days sooner.

Total waiting days saved 58,800

Understanding the problem

Future state planning identified that in order to improve turnaround times, result letters need to be issued on the same day that the results are authorised by the laboratory.

Results of cervical cytology samples were downloaded to the screening agency once a day late in the evening, irrespective of the time the result was authorised on the laboratory computer system.

No result letters were issued the same day as the authorised reports, and some letters were being delayed by up to three days.

How the changes were implemented

Changing to two downloads per day would initially ensure up to 50% of results available to be posted out a day earlier.

- To ensure a continuous flow of samples ready for reporting, a pull system has been set up across the prep lab, office, screening room and call/recall agency.
- When the future state map was developed to optimise workflow, the team recognised that the pace of work through each department would be determined by the recall agency.
- A timetable was drawn up to ensure that the required number of samples and forms are processed in a planned schedule throughout each working day. Visual management is in place to ensure the schedule is adhered to.

- Agreed volumes of work, calculated from demand and capacity analysis are collected at agreed times throughout each day from the laboratory to the office for registration, from the office to the prep lab for processing, and from the prep lab to the screening room for sending the expected number of authorised reports in each daily electronic link to call/recall. This maximises the number of letters dispatched on the same day that they were reported from the screening room.
- Clearly marked, standardised collection points for work completed are used to ensure each department knows where and when to pull completed items into their area. The time of day and volume of work pulled is indicated through the use of red/green kanban cards acting as trigger signals which alert departments to what work is ready and in what volume as compared to the timetable.
- This occurs three times per day with a visual management system in place to clearly show when deliveries are made but can be increased/decreased at anytime to reflect fluctuations in demand and 20 capacity.
- Deviations from the norm are monitored daily, discussed at huddles and counter measures put in place if required.
- Team members attend each others huddles with a weekly scheduling review taking place at the Monday huddle which involves all areas.

Measurable outcomes and impact

- On average 41% of results reported each day are now sent to call/recall at 11.30 am and these result letters are all posted out the same day.
- 38% of result letters are received by the patient a day sooner than before.
- A further 8% of result letters are received three days sooner.

Ideas tested which were successful

- Lean methodology discourages batching. The idea was to reduce the batch size of results sent to call/recall enabling them to process the results and send out the result letters the same day.
- The multiple files involved restrict call/recall from getting all reported authorisations dispatched as results on the same day.

How this improvement benefits women

On current workload figures this change means that over 33,600 women per year will receive their cervical cytology results a day earlier than previously and 8,400 will receive results three days earlier.

How will this be sustained/potential for the future/additional learning?

- Standard operating procedures have been updated to reflect the changes implemented.
- Daily problem solving at five minute meetings to level out any deviations from the planned timetable to ensure the target number of result letters is dispatched.
- Further enhancements to visual management controls and communication will ensure that a standard minimum level of work outstanding in each area supports flow through all steps in the process.
- Further root-cause analysis and PDSA problem solving sessions will take place to evaluate whether changes to the Exeter system will enable the laboratory to send results to call/recall in real time.

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Case study 3

Reducing manual matching and first class post

Anglia Support Partnership

Summary

Over 17000 result letters are issued each month by Anglia Support Partnership call/recall service. Approx. 2000 women are now receiving result letters two to three days sooner than they would have this time last year after reducing the number of non hit query cases from 15% to 5%.

A further two days has additionally been saved following the introduction of the use of first class mail.

Understanding the problem

The reduction of mismatched reports, caused by typing discrepancies, booking in errors (laboratories) and out of area results was targeted as a major source of delayed result letters. In July 2008 between 15 and 20% of results received were mismatch/non hits caused by invalid senders, out of area, sender with end date in the past, incorrect source type, incorrect management of women. These defects needed to be reduced so women received their result letters in a more timely fashion.

The postal service was taking too long with many result letters taking three days from dispatch to receipt by woman.

There was manual distribution and dispatch of result letters in Norfolk, which caused delays due to unreliable equipment often with two day breakdowns. Staff were having to watch the equipment to deal with regular issues.

Some systematic data collection was undertaken to assess the range of 'non hits' using visual management techniques.

A postal audit was performed to assess delivery times.

An audit of costs and time for the process of 'in house' dispatch of letters, assessing the use of folding/inserting machine, time spent and local costs, was undertaken as part of a business case that would

DATE	LAB	TOTAL RECORDS	NO HITS	NOTES	MANUAL MATCHING	NON HITS	% HIT
17/8	E	58	57	1	0	1	
	E	25	24	0	0	1	
	A	52	50	1	2	0	
18/8	N	1	1	0	0	1	
	E	95	93	1	1	1	
	N	6	5	0	0	1	

Visual management techniques

demonstrate the resource savings that could be made if outsourced letter production was used.

How the changes were implemented

- Visited mailing bureau, to review full pathway and undertook a postal audit to assess the difference in delivery times between the first class and business class service.
- Migrated whole Anglia Support Partnership (ASP) call/recall service to the mailing bureau.
- Engaged with laboratories to review all senders and established practice codes as senders, checked all postcodes correctly mapped.
- Previously, result files were processed throughout day then 8am next morning results letters generated. Now the results letters are generated immediately and don't wait until the next day.
- Enabled remote access, from their own desktop, for all staff across ASP to the Cambridgeshire, Norfolk and Suffolk systems to enable result input and cross-working across the three agencies.
- Established practice nurse and administrative training sessions for primary care staff on general call/recall, Open Exeter and common queries.
- Introduced visual management to capture all lab-link activity.

- Introduced standard working procedures in general processes across all three agencies.

Measurable outcomes and impact

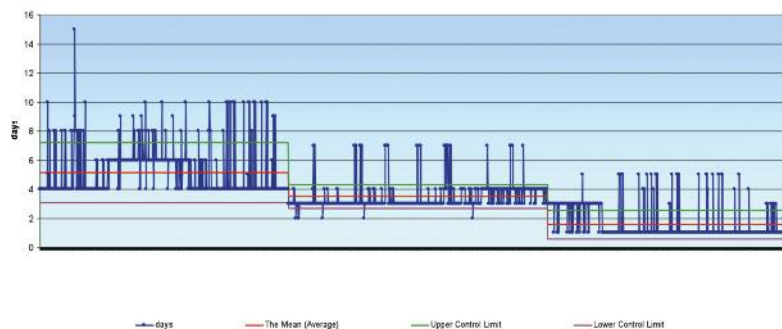
- The audit of costs of the folding/inserting machine showed that savings in excess of £7000 per year could be realised by switching to a mailing bureau assuming fully operational equipment. The time savings would be greater when taking into account equipment failures and the time this had previously added on to TAT.
- The postal audit showed that if first class post was used a further two days could be removed from the time taken for the woman to receive her letter.
- The non-hit/defect rate has reduced from 15% to 5% on average (see table 1).
- The graph on the right demonstrates that the average time from result received by recall to letter received by woman has reduced from five days to 1.57 days since October 2008.
- Staff comments include: 'The visual management of lab-link files is great because it gives an instant picture of the service'. 'The use of the mailing bureau is great as I no longer have to sit and watch the folding machine whirring through'.

Table 1:**Before changes were made**

Date	Lab	Total Records	No. of hits	Notes	Manual Matching	Non Hits	% of hits
02.01.09	West Anglia	195	174	4	4	21	10.77%
05.01.09	West Anglia	172	143	4	1	29	16.86%
06.01.09	West Anglia	13	11	0	1	2	15.38%
08.01.09	West Anglia	11	10	0	0	1	9.09%
07.01.09	West Anglia	257	220	1	3	37	14.40%
09.01.09	West Anglia	225	190	3	0	35	15.56%

After changes were made

Date	Lab	Total Records	No. of hits	Notes	Manual Matching	Non Hits	% of hits
22.07.09	West Anglia	44	43	0	0	1	2.27%
23.07.09	West Anglia	66	64	1	1	1	1.52%
24.07.09	West Anglia	74	70	5	0	4	5.41%
24.07.09	NNUH	41	41	1	0	0	0.00%
24.07.09	NNUH	48	46	1	0	2	4.17%
27.07.09	NNUH	56	52	0	1	3	5.36%

West Anglia - Oct 08, Jan 09 and Jul 09 data - result received by recall to letter received by women**Ideas tested which were successful**

- Mapping/checking of all postcodes enabled results to be sent to the correct agency in the first place, causing fewer 'non hits'.
- Mapping/checking all sender codes to ensure accurate booking in of samples in the laboratories, reduced sender queries and 'non hits' when the results were received.
- Running the CP/result letter production job after all lab-link files and queries had been resolved meant that result letters were sent the same day they were received and processed.
- Remote access to all three 'Exeter systems' meant immediate manual entry of results where it had been sent to the wrong agency

originally. Although results can be input at any of the three agencies results currently have to be generated from each office, but this is under review to make the appropriate changes so result letters can be run from any of the three agencies.

- The decision to move to first class mail meant that women received result letters quicker.
- Following the visit to the mailing bureau and a greater understanding of the business needs from both sides, communications between the bureau and call/recall improved resulting in an improved service.
- Feedback from the primary care admin training sessions was very positive with comments such as

'This course has meant I'll have fewer telephone queries in future'. 'I now have a far greater understanding of call/recall and what it all means'.

Ideas tested which were unsuccessful

- The first attempt at the postal audit was unsuccessful. Inclement weather meant post could not be delivered.
- The initial implementation of using mailing bureau in Norfolk was problematic because there was not enough testing done before going live.

How this improvement benefits patients

On average, 17,282 women are receiving their result letters two days earlier and on average 1.5 days after the result was authorised in the laboratories.

How will this be sustained/potential for the future/additional learning?

- The introduction of improved communication between all programme providers (call/recall, labs, primary care) will be sustained as no-one wants to return to the old ways of working.
- More time is available to develop further service improvements. Staff are being used appropriately to do the job they are best at and standardised working has been introduced to improve accuracy between the lab and call/recall.
- Potential for the future – NNUH lab should develop electronic links with more than two agencies to enable the results to be sent to the correct call/recall agency based on patients postcode although this is not currently possible due to funding issues preventing progress.

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11. The nine wastes

The key to adding value is to remove waste. So, what is waste?

There are nine forms of waste and these can be easily remembered with the mnemonic –

TIM A WOODS

Transport

Material or information that is moved unnecessarily or repeatedly e.g. unnecessary movement of samples.

Inventory

Excess levels of stock in cupboards and store rooms e.g. specimens waiting to move to next step in process, or people waiting for tests and results.

Motion

Unnecessary walking, moving, bending or stretching e.g. equipment placed in wrong location, unnecessary key strokes.

Automating

Where technology is substituted to compensate for a poor inefficient process/processes

Waiting

Waiting for samples, equipment, staff, appointments or results e.g. patients waiting for test and results, staff waiting for other staff, equipment or information.

Overproduction

Producing something before it is required, or more than is required e.g. unnecessary / inappropriate tests, batching samples, tests and information

Over-processing

Duplication of data or repeat testing due to defects e.g. dual data entry, additional steps and checks

Defects

Errors, omissions, anything not right first time e.g. poorly labelled specimens and requests, insufficient or illegible information.

Skills utilisation

Unused employee skills e.g. highly qualified staff performing inappropriate tasks

WASTE COSTS MONEY AND ADDS TIME

The following case studies illustrate how the sites have removed waste from their systems to improve turnaround times.

“No worker, particularly in healthcare where the well-being and safety of another human comprises the core of the work, appreciates having his or her time wasted.”

Cindy Jimmerson

A3 Problem Solving for Healthcare.

Case study 4

Specific bags sent straight to laboratory

North West London NHS Trust

Summary

Reorganisation of the way cervical cytology samples are collected from GP surgeries and delivered directly to the cytology department has resulted in a reduction in the TAT of between 0.1 and 2.5 days for approximately 90% of women. MLA staff are also saving approximately 50 minutes per day through no longer walking to and from pathology reception to collect the specimens. This equates to a saving of approximately **nine days or 110 miles a year**.

Understanding the problem

- During their 'walk the process', the core team observed large volumes of pathology specimens being delivered in large specimen transport bags to main pathology reception.
- Specimens were sorted by one member of reception staff into appropriate boxes for the different pathology disciplines. The process was laborious and occasional mistakes occurred as it was not always clear to the person doing the sorting which discipline the specimen belonged to.
- Pathology reception is located on the opposite side of the hospital to the cytology lab. An MLA from cytology spent up to 15 minutes walking back and forth to collect specimens. On arrival, the staff member usually waited until all specimens were sorted in case any cytology work was in the bags recently delivered. This was done up to five times a day five days a week.
- Waiting and transport waste were clearly identified by core team members.

How the changes were implemented

- Core team members discussed the issues identified with the staff members responsible for this process.
- Clear separation of cytology specimens from other types of pathology samples was identified as a way to make sorting easier.
- Large pink specimen collection bags were purchased and distributed to all sample taker practices and clinics.
- Sample takers were instructed by letter and at meetings to use the pink collection bags exclusively for cytology work.
- Cytology samples contained in pink sample bags could easily be seen amongst the rest of pathology specimens which made the sorting out process much quicker and efficient.
- Drivers were later instructed to keep pink bagged samples separate from other pathology specimens during collection and asked to deliver them straight to the cytology department.

Measurable outcomes and impact

- 90% of cervical cytology samples delivered directly to cytology department resulting in a reduction of between 0.1 – 2.5 days in the TAT for these specimens.
- MLA staff saved approximately 50 minutes walking time per day. This equates to a saving of approximately nine days and 110 miles a year, allowing more effective and productive use of MLA time around the department.
- MLA staff are happier.

How this improvement benefits patients

- By implementing the use of dedicated cervical cytology sample bags which are delivered directly to the cytology department has meant a reduction in the TAT of between 0.1 and 2.5 days for approximately 90% of women.

How will this be sustained / potential for the future/ additional learning?

- The practice of separating cervical cytology samples from other pathology samples and having them delivered directly to the department has worked well since its introduction and has now become the normal practice.
- The successful use of dedicated cervical cytology specimen bags has been noted by other pathology departments and is likely to lead to the introduction of dedicated specimen collection bags in other pathology disciplines.

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Case study 5

Reducing the backlog

Norfolk and Norwich University Hospital NHS Foundation Trust

Summary

The Norwich laboratory processes and screens over 60,000 samples per year and is pilot site for HPV testing. By applying Lean methodology to remove waste and improve the flow of work we were able to:

- Remove the backlog of screening samples.
- Take in-house additional screening whilst coping with a 48% increase in demand (February 2009).
- Still achieve 97% meeting the 14 day TAT by July 2009.

Understanding the problem

In October 2008 the lab faced the following situation:

- A backlog of over 4,000 samples with some being set out for screening to another site.
- 24 day average for receipt to authorisation turnaround times (TAT) with a range of 2-44 days.

SPC charts provided the evidence to demonstrate the waiting at each step of the pathway.

To achieve the goal of 100% in 14 days changes had to be made across the whole pathway, with the support of a multidisciplinary team of staff representing the whole pathway.

How the changes were implemented

Using the Lean tools gained from national events and on-site training, small changes were made to the process and SPC charts were used to measure the benefits.

The changes implemented included:

- Stopped re-screening of abnormal samples if they had already been seen by checker screening trainees work.
- Removal of excess checking of 'open exeter', to stop over-processing.
- No hard copy reports were printed for some GPs (who requested no paper copy) eliminating over-processing.

- Stopped checking of previous computer system and adding numbers by office staff, as it was not used anymore.
- Stopped writing management advice on green forms.
- Stopped 'special attention' stamping of abnormal results.

Measurable outcomes and impact:

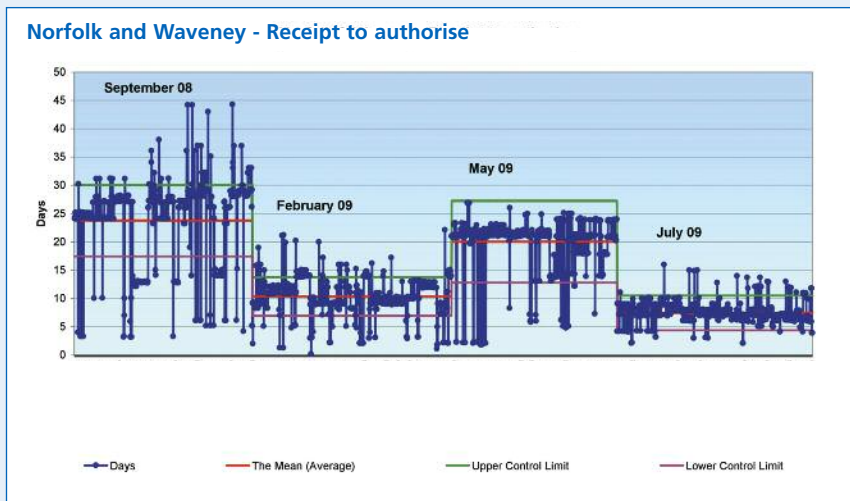
By February 2009 the lab had data to demonstrate:

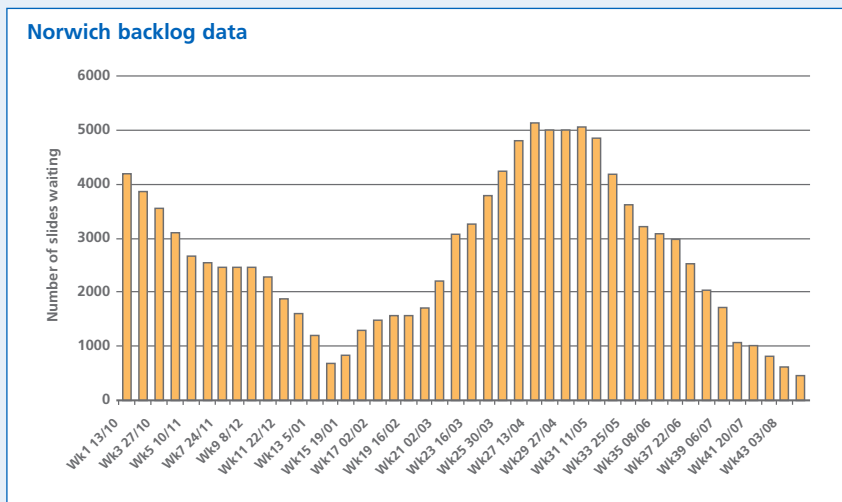
- 10.5 days average receipt in the lab to issue TAT with a range 2-22 days maximum.
- Backlog reduced from 4,000 to 655 by (February 2009).

An increase in demand in February 2009 took the backlog back to over 5,000 by the first week in May 2009.

By continuing with the changes already made and introducing others by August 2009 the lab could demonstrate:

- Backlog of less than 500 by August 2009, representing only two days work.
- 7.4 days average receipt to lab issues TAT with a range of 2-16 days (July 2009).
- All work is now screened in-house and the lab is in a position for other work.





How will this be sustained/ potential for the future/ additional learning?

By reducing the backlog staff have seen several benefits including:

- Screening staff comment that they no longer feel under pressure to do more all the time.
- Clerical staff have freed up time by reducing non-value adding activities to enable them to concentrate on the parts of their job that add value to the process.
- There is now the potential for taking in work from other laboratories in the area still struggling with backlogs as a result of the increased demand.

Ideas tested which were successful

- Stopped linking of old Sunquest reports, saving approximately one hour/person/day.
- Bell to alert porter, office staff time saved approximately **one hour per day**.
- Accepting pre-printed HMR forms saves time on phone calls and stops sample processing delays.
- Call/recall centre advising lab of wrong recall by email and phone call. Changes made and re-sent electronically. This has removed paper, cut down TAT by 24 hours and saved lab staff time.
- Each screener now has their own PC to enter results etc, so eliminating the waste of waiting to use a piece of equipment.
- Day books were eliminated (over processing) saving time for more screening and allowing the screening of five extra slides per day per screener.
- Screeners doing their own slide filing has released ½ a days time in the office.
- Infection information is now circled and not written on forms, again removing the waste of overproduction.
- Introduced bar-code readers in screening to eliminate the overlabelling of slides with patients name which has released office time, saved money on labels/printing and prevented slides waiting before going through for screening.
- Lab introduced letter informing sample senders of out of scope samples to reduce inappropriate demand.
- PCT core team member re-enforced non-acceptance of out-of scope samples by letter in GP magazines and by writing to GPs separately.

How this improvement benefits patients

Over 60,000 women in the Norwich area can now expect to receive their results within 14 days of the sample being taken.

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Case study 6

Moving the fridge reduces walking

The Leeds Teaching Hospitals NHS Trust

Summary

Waste of motion reduced. 123.7 miles of walking per year has been removed, equivalent to 8.25 working days of capacity now available for other duties.

Understanding the problem

- The core team walked the pathway from the time a cervical cytology sample was received at specimen reception to the time the result letter was sent out by the screening agency and produced a value stream map.
- During the walk, two initial areas of waste which could be reduced were identified - distance from fridge to lab and distance from stock room to lab.
- Process sequence charts were produced detailing all steps of the process.
- The time taken and distance travelled at each step of the process was recorded.
- By looking at the process sequence charts we identified two more areas in the lab where waste in the form of motion could be reduced - distance from prepstain machine to sink and distance from screening room to office for prescreening sheets.

How the changes were implemented

Area 1

The gynaecology consumables stockroom was moved to a room nearer to the preparation laboratory.

Area 2

Samples waiting processing were stored in a cold room in the specimen reception area which was 69 metres from the laboratory. A refrigerator was placed in a room adjacent to the preparation laboratory. Samples were stored there until the backlog of samples to be processed was removed and storage was no longer required.

Area 3

At the end of processing on the prepstain machines, trays of samples were carried to the sink across the room to tip off the excess alcohol

then back across the room to the coverslipper. A bowl was placed between the prepstain and the coverslipper for this purpose.

Area 4

Rapid pre-screening results were entered onto the computer in the cytology office and the forms then returned to the screening room. These are now entered onto the computer in the screening room

Measurable outcomes and impact

- Area 1 (stock room). A saving of **16,048 yards/year** (38% decrease in time).
- Area 2 (fridge). A saving of **76,365 yards/year** (100% decrease in time).
- Area 3 (bowl). A saving of **79,685 yards/year** (4% decrease in time).
- Area 4 (pre-screening). A saving of **45,653 yards/year** (15.5% decrease in time).
- A total saving of **217,751 yards** or **123.7 miles per year**, the equivalent of **4.72 marathons**
- At a walking pace of two miles per hour these changes have released **8.25 working days** of capacity for other duties i.e. more processing time to help achieve our targets.

How this improvement benefits patients

These savings will help to improve the turnaround time of all cervical cytology samples.

Three of these changes released time in the sample preparation area. A timetable has now been devised that enables 12 runs per day (576 samples) to be processed daily which meets the current demand and enables samples to be processed on the same day or the day following receipt in the laboratory.

The time saved in area 4 (pre-screening) releases time for the office staff to register samples.

How will this be sustained/potential for the future/additional learning?

The building housing the current accommodation is to be closed.

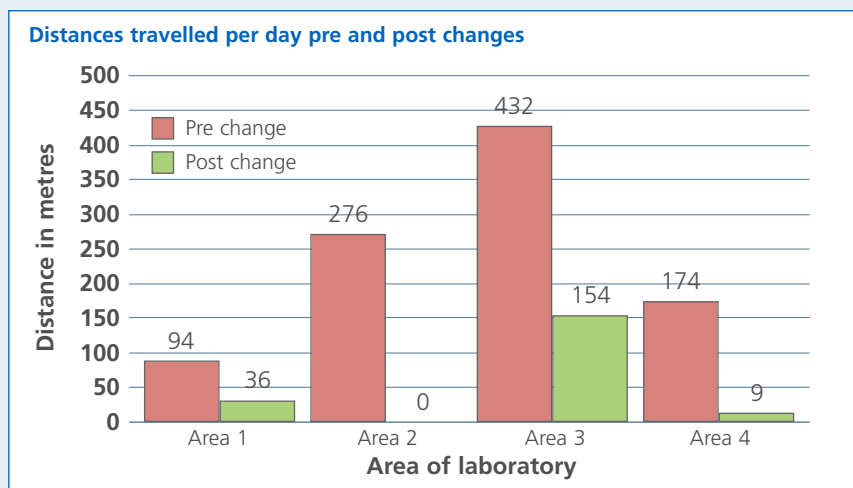
Lessons learned from the service improvement journey will inform planning the layout of the new accommodation. Awareness of waste due to travelling time has been raised, and the team will aim to minimise travelling distances further in their new accommodation.

Standard operating procedures have been updated to reflect the changes implemented.

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Case study 7

Sample collection trips reduced

Ashford and St Peter's Hospitals NHS Trust

Summary

Changes made have resulted in the reduction of the waste of motion in unnecessary trips to the pathology specimen reception area releasing approximately 20 days per annum of staff time for value added activities.

Understanding the problem

The cytology department is in the basement of the pathology lab. The regular five minute journey to collect samples from the pathology lab sample reception was totalling 80 minutes each day.

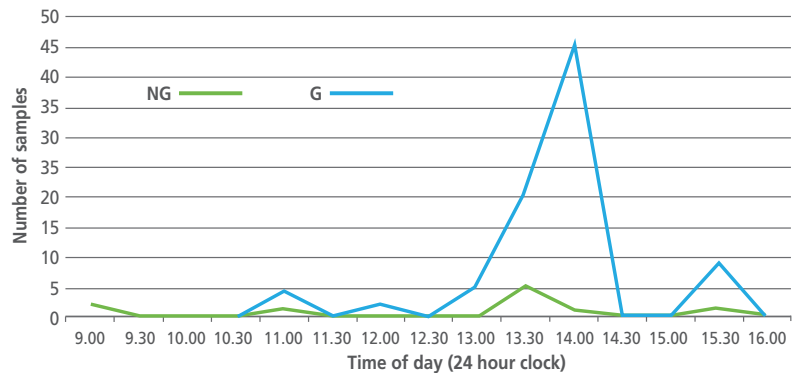
Analysis of the situation identified that:

- Time was wasted by unnecessary trips to the specimen reception area when there may be nothing to collect.
- The MLAs collection trips were random and so they didn't know that someone else was already en route or had just been.
- The time of sample collection was not coordinated among MLAs resulting in overlapping in 25% them. The schedule of trips to reception were not clear during handover.

How the changes were implemented

- Delivery times by the collection vehicles to specimen reception were noted and cytology sample collection trips were adjusted to fit.
- Sample collections were changed to a set time to maximise trips to reception
 - first thing in the morning and from 1.30pm until 3pm, collections were scheduled every 30 minutes
 - at all other times, a phone call to reception every 30 minutes established whether there were any samples to collect.

Number of samples found at each collection



- Telephones were installed in both gynae and non-gynae prep rooms to make calling reception easier.
- The use of a reversible card added Visual management indicating whether someone had collected samples or not.

Measurable outcomes and impact

- Overlapping stopped because trips were planned and visual management provided the control.
- Trips to specimen reception were reduced from **80 minutes per day** to **45 minutes per day**, saving **35 minutes per day** of work time.

Ideas tested which were successful

- Telephones installed in the prep rooms.
- Visual management card to indicate collection of specimens.
- Study and re-evaluation of specimen delivery times and adjustment of sample collection trips accordingly.

How this improvement benefits patients

An efficient department where skilled staff work efficiently has contributed to the reduction in turnaround time.

How will this be sustained/potential for the future/additional learning?

Visual management provides the day to day control of motion between the cytology lab and specimen reception.

In the longer term continued awareness of delivery times and volumes will ensure collection journeys are appropriately timed.

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Case study 8

Changing quality control (QC) procedures

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

Changing the timing of the QC process reduced the turnaround time by one day during the week and by three days at weekends. The removal of waiting means that samples are now authorised on the same day that they are screened, instead of waiting until the next working day.

Understanding the problem:

QC used to be done in the mornings. This was based on a traditional idea that this was because staff felt they were fresher. It was 'because we've always done it that way'.

The slides primary screened the day before were distributed to staff the next morning by a senior BMS. This did not guarantee all the QC would be done on the same day as unauthorised cases could be missed due to staff sick leave. Once QC'd the results were released overnight to the call/recall office for result entry and letter printing. An audit of workflow highlighted this step as a major source of the waste of waiting.

How the changes were implemented

It was agreed that slides should be QC'd on the same day that they were primary screened to minimise the TAT. Changes were made in three phases:

1. Batch sizes for primary screening remained the same (20). Primary screeners put batches of 10 slides into a central QC area on a continuous basis through the day. Screeners were to pick up QC throughout the day, carry out the task and authorise them immediately.

Any discrepancies to be passed onto the checking staff straight away to maximize the number of slides authorised on the same day.

This change did not increase the number of samples authorised on the same day.

2. The process was mapped using a grid to collect data. The team looked at who was carrying out this task and the numbers of slides being QC'd. They identified that although the initially stated preference of staff was to do the task in the morning, several people were leaving the slides until the afternoon. They also identified uneven work distribution amongst QC staff.

A brainstorming session was held to identify how best to design the workflow ensuring slides would be available for QC as soon as possible after completing the primary screening step. The intention was to keep movement of staff to minimum and ensure an even distribution of work.

One suggestion was to have a cut-off point for primary screening each day. This was rejected as there would still be a number of QC requiring authority at a time in the day when fewer staff worked and those remaining are needed to deal with the peak time for sample delivery.

3. The batch sizes for primary screening were reduced to 10 slides which removed the need to transfer them to smaller trays for QC. The screening staff then alternated one batch of primary screening with one batch of QC.

Each staff member was asked to place their completed primaries in a tray, fill in a chart (with initials and time) and then pick a corresponding tray to QC.

After an initial PDSA cycle, an assessment was made of progress. There were still slides waiting to be QC'd at the end of the day – these represented women who would have to wait longer to get their result letters. On further investigation, some staff were not following the new workflow. One group of staff were picking more than one QC when they

started work or during the day and another group of staff were not picking up QC at all.

This caused the following problems:

- Individuals were re-creating larger batches of work.
- No QC was available for some staff after they completed their primaries.
- Surplus of QC appeared later in the day when there was less staff to complete the work (caused by earlier batching activity).
- Uneven distribution of work between members of staff.

Further explanation of the reasons behind the change and re-emphasis of one tray into QC - one tray out for QC have now been successful.

Measurable outcomes and impact

The majority of slides which require the primary and QC processes are now screened and the reports authorised on the same day.

The SPC chart shows the period before the changes started where there was longer TAT and variation in the time taken for a sample to be authorised. The second period shows the initial change period where there was some improvement to TAT but there is still considerable variation in the time samples took to authorise. The third period shows that the TAT has now dropped and is smooth, with more consistency in samples being authorised.

Case study 9

Slide matching

Barts and The London NHS Trust

Summary

The process step of matching the slides and request forms has been removed. By removing this step the team has reduced the delay from the time of data entry and slide staining to when the stained slides reach the screening room. Space has been gained in the laboratory staining area and MLA time has been saved.

Understanding the problem

- There was a delay from the data entry office which caused a backlog of slides in the staining area.
- There wasn't enough space for the backlog of slides or to match the forms back to the slides and the area was chaotic.
- Although there were no untoward incidents in this area, there was the potential for errors to occur.
- There was no value to the step of matching slides to forms as the screeners perform a second check of the slides and forms before screening.

How the changes were implemented

- The team removed the process of matching the slides and request forms in the staining area.
- Before implementation the team reviewed any potential risks, ensured all staff were briefed about the new process and defined the timescale for the PDSA cycle.
- The new process was a success and now runs in the following way:
 - Batches of 10 are data entered in the office and taken directly to the screening laboratory instead of the staining area.
 - Slide trays of 10 are taken directly from the staining area to the screening laboratory and do not wait for the request forms to be returned from the office.
 - It is imperative that all the slides and request forms are in numerical order.
 - When the screeners require work, the work is available to be pulled.

- The screening staff take the first tray of 10 slides and match it with the first batch of 10 request forms. These details are checked and the slides screened and labelled by the same person in one continuous process.

Measurable outcomes and impact

- One step has been removed from the process.
- There is now no delay of slides waiting in the prep room.
- MLA time spent matching slides (approximately 90 minutes per day) has been saved.
- The bench used for matching slides in the prep room is no longer chaotic. The bench is clear and tidy for other MLA duties.
- It is now easier to find request forms. There were three potential places to find a request form which has been reduced to two.
- The slides are in the screening laboratory earlier which enables the screeners to know exactly how much work is waiting to be screened.

Ideas tested which were successful

- The initial idea to remove the matching has been a success.
- The meticulous planning, team work and excellent communication at the daily huddles aided the smooth transition from the old to new process.
- The team used the PDSA cycle to resolve any issues and improve on the initial pilot study.

Ideas tested which were unsuccessful

- The team was initially concerned about the removal of this step. It was thought that the changes would add errors and not speed up the process. These perceptions were proved unfounded as there have been no errors, time has been saved for the MLA staff and the slides/request forms are reaching the laboratory in a timely manner.

- The team also thought that the task of matching the slides and forms had been moved from the MLA staff to the screening staff. During the pilot study, the staff realized that this was not the case as the screening staff were checking the slides and request forms on collection in the screening room.
- This process hasn't worked for the slides that require reprocessing as the request form is required when this is done. The team now has system for slides which require reprocessing to ensure the form always accompanies the sample and/or slide.

How this improvement benefits patients

- This improvement benefits all women screened at Barts and The London NHS Trust.
- The matching step in the chaotic prep area has been removed reducing the risk of errors.
- The MLA staff now have quality time to spend on other duties.

How will this be sustained/potential for the future/additional learning?

The PDSA cycle was proven along with the communication and team work.

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Case study 10

Removal of date stamping

The Leeds Teaching Hospitals NHS Trust

Summary

Eight hours per week saved by changing the way received samples are time/date stamped.

Understanding the problem

The team was aware that the process for time and date stamping each form in specimen reception was taking up time whilst also causing or risking errors.

- Each specimen and form was unpacked; the A4 size form was unfolded and placed in a date stamping machine. The form was then refolded and put back in the bag with the specimen to await numbering.
- Each person presented forms to the machine slightly differently resulting in date stamps appearing in different places on each form and, in some cases, obscuring other information.
- Some stamps were either poor or completely illegible. Because the date stamping was being done in batches, dates often fell out of sequence with the subsequent numbering of forms and vials.
- The time and date of receipt stamped on the form was included in the data entry by the office staff when they registered the sample onto the laboratory information system.

The team recognised this as a waste of over processing to meet the CPA requirement.

How the changes were implemented

The team referred to their pathology quality manager to check the CPA requirements. They suggested that the first form on each batch be marked up with the time and date of receipt and the office staff would input this data for each sample in the batch being handled.

It was agreed that such a process would meet the CPA requirement.

Standard work was agreed. As each crate of samples is received into specimen reception the date and time is written on a label attached to the crate. This date and time is then written on the first form, in red pen, in the same place on the front form of each batch of forms.

The date and time entered by data entry staff now accurately reflects the actual time the sample is received by the lab rather than the time it is unpacked.

Measurable outcomes and impact

The new process is saving 15 seconds per specimen. Given that the lab processes approximately 100,000 samples per year, this change is saving **eight hours per week** as well as the small cost saving on the printer and ink (which is still used for non-gynae samples).

Ideas tested which were successful

The staff member in the lab who was responsible for this process identified this potentially unnecessary activity when the core team walked the path of the process.

Ideas tested which were unsuccessful

The team initially wrote the date and time on a post it note which was stuck to the first form in the batch.

They noticed that the post it notes were at risk of becoming detached from the forms and changed to writing directly on the form.

How this improvement benefits patients

The team have freed up the time referred to above to be able to focus on the value steps in the process thereby reducing the overall TAT to deliver results to women.

How will this be sustained/potential for the future/additional learning?

This suggestion came from an individual who was initially skeptical about the benefits of Lean. Since this idea they have continued to make suggestions and have shown a keen interest, playing an important role in continuous improvement.

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Case study 11

Removal of the day book

Norfolk and Norwich University Hospital NHS Foundation Trust

Summary

For many years screening staff had kept a personal 'daybook' where handwritten details of each case screened were recorded. This practice was in place to enable the screener to monitor their workload and check the outcome of a particular case.

While undergoing Lean training this step was identified as the waste of over-processing.

The practice was discontinued within a few weeks of becoming a pilot site which resulted in time saved, a marked increase in productivity and improvement in work flow.

Understanding the problem

Handwritten day books preceded computer records of results and were a convenient way for screeners to monitor their personal screening figures.

There was no benefit in continuing the practice since all the information written in the books could be extracted from the computer if needed for performance analysis.

How the changes were implemented

This idea was suggested by one of the screeners after learning about waste in the pathway and examining their own area of work.

- One cyto-screener stopped using a daybook for a week as a trial.
- The effects were evaluated and all the screening staff agreed to stop using daybooks.
- The screeners have easily adapted to this change as the suggestion came from them.

Measurable outcomes and impact

Writing the details of each case in the day book was quantified:

- One minute per case - each screener was saving up to 30 minutes each day.
- Enough time to screen four extra slides per screener, allowing 30 extra slides to be screened each day (150 per week/7,500 per annum).
- Screeners reported improved work flow around their work station with the book removed.

Although the significant backlog of samples in the lab was already reducing before this change was introduced, the rate at which the backlog reduced increased dramatically.

How this improvement benefits women

By increasing time for screening, the turn around time (TAT) has been reduced, therefore approximately 60,000 patients will benefit from receiving their results within 14 days.

How will this be sustained/ potential for the future/ additional learning?

It is unlikely that the lab will revert to using a book to record results as removing this step has resulted in:

- Significant time savings.
- Removal of duplication.
- Staff looking at the whole process and questioning the purpose and value of each step.
- Staff morale improved as backlog disappeared.

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Case study 12

Adjusting download times to the primary care support services

Ashford and St Peter's Hospitals NHS Trust

Summary

The time results are sent to call/recall was adjusted so that result letters could be printed and posted the same day that the result is reported, instead of results waiting to be processed the following day.

The percentage of women receiving their result letters the day after their result is reported has increased from 6% to 67%.

Understanding the problem

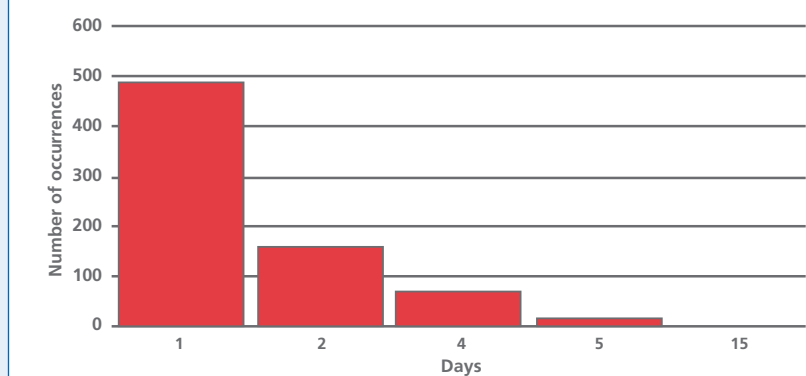
Results were being sent by electronic transfer to the call/recall centre once a day between 3:30pm and 4:00pm. This did not allow sufficient time to process the file and print the result letters before the post room closed and so result letters were printed and posted to patients using first class post the following day.

This was identified as having a negative impact on efforts across the pathway to meet the new seven and 14 day turnaround targets.

How the changes were implemented

- Laboratory staff visited the call/recall centre to improve joint understanding of the process.
- It was agreed that the electronic run would be changed to 1:00pm. This would allow time for the file to be processed and letters printed off and posted the same day.
- The May 2009 histogram shows 67% of result letters for the month following the change arrived the next day proving that the process change made a difference.

Histogram of PCSS turnaround - May 2009



Measurable outcomes and impact

61% of patients received their results a full day earlier.

By June 2009, 68% of women received their results within seven days and 99.85% within 14 days.

Ideas tested which were successful

Collaborative working between the laboratory and the call/recall centre identified this opportunity and made the change possible.

How this improvement benefits patients

61% of patients now receive their results a full day earlier.

How will this be sustained/potential for the future/additional learning?

This improvement is a permanent change in procedure so the benefits will be sustained.

Showing how a simple change can have such a big impact has improved staff morale and motivated everyone to look for more ways to improve.

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Case study 13

Zero tolerance of defects

Hull and East Yorkshire Hospitals NHS Trust

Summary

Monitoring of defects highlighted errors on the forms and vials that the laboratory spent time dealing with.

A potentially serious issue was recognised by clinical governance and a zero-tolerance of errors was introduced resulting in a consequent drop in errors of 1% per month and a saving of approximately **120 hours annually** of lab staff time which equates to £1,020/annum.

Understanding the problem

Data collected over a two week period showed that 154 errors from primary care were identified.

Time management issues for processing and admin staff groups were raised due to the excessive amount of working time lost tracking and correcting request forms and specimens received from primary care.

- Monitoring evidenced the amount of non-value added time lab/admin staff spent chasing minor discrepancies and delays in processing due to more serious errors.
- The number of samples returned per month was counted and monitored to identify trends.
- Wastes identified:
 - Defects** - ranging from missing information on vial/request card to wrong information on either or a mismatch between the two.
 - Unnecessary waiting** - delays were caused by samples being returned to the GPs practice - extending turnaround times by an average of four days.
 - Over processing** - at data entry due to duplication or rework of every defective sample received.

How the changes were implemented

- A 'Shared Learning Notice' was sent out to all sample takers in the primary care sector from the clinical governance teams of the relevant PCTs informing them of the changes.

Cytology department - cervical sample request card

Please fully complete the request card as all the details are used either to identify the patient or for the clinical screening process.

- All samples which had errors were returned to sender.
- The exemplar form shown above was sent to all sample takers.
- Laboratory staff gave presentations at sample taker update meetings and GP forums.
- Implementation of visual management for request cards, with mandatory information clearly identified in an attempt to mistake proof a manual process.
- Standard work - zero tolerance of defects.

Measurable outcomes and impact

- A reduction in returns by approx 30 samples per month.
- Approximately **10 hours a month** of lab staff time saved (or 15 days per annum).
- Cost saving of approx £85 per month.

Ideas tested which were successful

- Communication with primary care teams: The problem of incorrect data on request forms sent into the lab was highlighted at LBC working party meetings between lab staff and clinical governance managers, where it was agreed that there was a high risk of a potential incident occurring.
- These were to be treated as 'near misses' and clinical incident forms completed, generating a clinical governance issue. This allowed a training and continual assessment of competencies approach to be established by the clinical governance team.

How this improvement benefits women

Improved quality and safety for all samples processed by ensuring patient information is correctly provided from source i.e. that the HMR101 form is filled in completely and correctly.

How will this be sustained/potential for the future/additional learning?

- Error logs will continue to be completed.
- Returns will continue to be monitored by trust clinical governance team.
- Persistent offenders are, and will continue to be, visited by a clinical governance manager.

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Case study 14

Improving mapping tables

Barts and The London NHS Trust

Summary

Changes to the laboratory mapping table reduced the reject rate for 'Test after Sender Ended' and 'Sender Unknown' at the call/recall centre.

Understanding the problem

- Since the links from laboratory to the call/recall centre were introduced in 2004, there had always been a large number of rejects. Since the Exeter software changed in 2007 there have been a large number of 'Test after Sender Ended' and 'Sender Unknown' rejects.
- The GMC code (national GP code) is used to transfer the results from the laboratory to call/recall. Unless this code is correct, and the information on each system matches, the woman's information does not transfer across the interface.
- It was evident that the number of rejects due to these two codes was above average and work was started by both teams to understand the problems.
- Data was collected to identify the extent of the rejects for the 'Test after Sender Ended' and 'Sender Unknown' codes.
- When the laboratory introduced twice daily downloads, these mismatches became a greater problem and any rejects on the second file of the day were delayed by one day.
- Findings showed that the rejects occurred when there wasn't a GP code assigned to every requester (i.e. sample taker in a health centre) or a resigned, retired or otherwise expired GP code was being used.

How the changes were implemented

- The laboratory team thought they knew the solution and changed the entire mapping table, only to find that there was no change to the number of mismatches.
- Future changes were trialled using the PDSA cycle which enabled the team to trial a number of small changes without dedicating a lot of time to something which may not have had any impact.
- After a number of trials, the team found the correct mapping table, implemented the change and, when the trial was successful, rolled out an updated mapping table.
- The newly updated mapping table links every requester to a GP national code.

Measurable outcomes and impact

- Data showed 60 GPs were causing 100% of the rejects, which equates to 20-30% of each file transferred to call/recall.
- The data highlighted a total of 187 rejects for two codes in one week. This did not include other mismatches (i.e. NHS number, address, DOB etc)
- Each day the rejects caused approximately two hours extra work for three call/recall staff.
- When call/recall were unable to resolve an issue, they would contact the cytology data manager who would resolve the outstanding issues. The data manager was receiving approx 15 requests per week which on average would take five minutes each to resolve equating to approx 40 hours per month saving for the call/recall staff and five hours per month for the laboratory staff.
- As a result of the reduction in rejects the laboratory is now able to send the morning file half an hour later thus increasing the number of authorised cases for which the letter is posted the same day.

Ideas tested which were successful

A close working relationship between the call/recall manager, the cytology service manager and the cytology data manager was key to resolving this issue.

After the initial change failed the team adopted a PDSA cycle for future ideas. This enabled them to trial changes on a small scale without investing too much staff time

Ideas tested which were unsuccessful

The team thought they knew the solution and spent a number of hours changing the mapping table without understanding the true root cause of the problem. This was a waste of time but was a valuable learning process.

How this improvement benefits women

- There are no delays in the letter being sent to the patient.
- It is a safer process as there is no manual input where error could occur.

How will this be sustained/ potential for the future/ additional learning?

- This improvement has forged greater links between call/recall and the laboratory.
- Any mismatches can be corrected immediately now the process is understood.
- PDSA cycles are key to ensuring changes work before full implementation.
- A future development could see practice codes being used instead of senior partner codes.

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Case study 15

Expanding roles in the prep room

Taunton and Somerset NHS Foundation Trust, Musgrove Park Hospital

Summary

Early analysis using a value stream map showed some significant problems in the prep room with large batches, unpredictable and irregular output, unused capacity during normal working hours and consequent delays in workflow.

The prep room is now staffed without interruption from 07:00 to 18:00 on a daily basis by extending the roles of the MLAs and has increased flexibility and sustainability.

There is a continuous flow of work leaving the prep room and the skill mix of staff has improved.

Flow throughout the laboratory has smoothed with a minimum of one day taken off the turnaround time as a result of more efficient processing and prep room productivity increased by 15%, with a greater level of both safety and quality in prep room processing.

Understanding the problem

When lab staff were asked what issues needed to be addressed, a number suggested that the prep room was not being used to its full capacity. There appeared to be long delays waiting for machines to finish and long periods of time where the room was unoccupied which it was felt were leading to delays in the workflow.

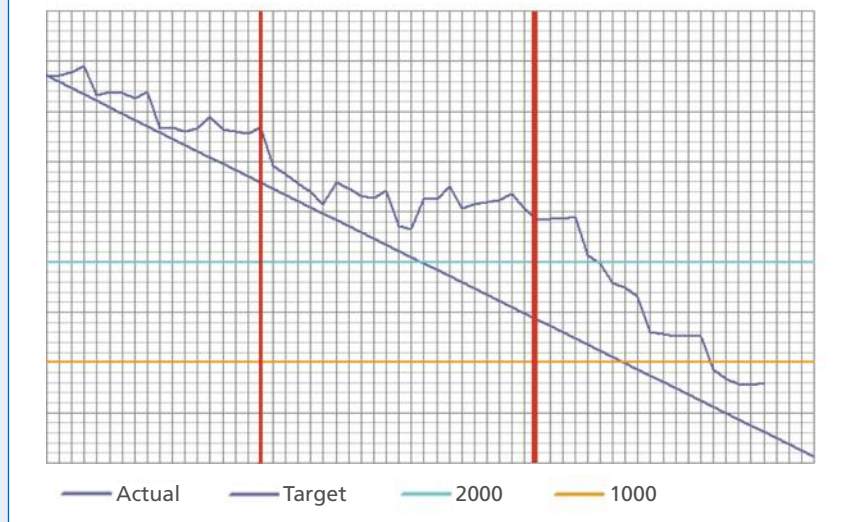
To understand these issues, further investigation included:

- An audit of the typical working hours of the prep staff.
- Analysis of the times when work left the prep room through the use of checklists completed by the prep staff.
- Analysis of spaghetti map after walking through the entire process.

How the changes were implemented

A series of PDSA cycles and small changes (Kaizen) were introduced over a period of several months. These included:

Backlog reduction targets



- Data entry staff became senior MLA's with training that included prep room duties. This enabled the prep room work to begin from 7am.
- Analysis of all job roles and re-assignment of tasks to more appropriate staff.
- Recruitment of a new full-time MLA.

Measurable outcomes and impact

The chart above highlights the backlog reduction from the 23 of April to the 31 July.

Initially there was a steady reduction until there was no screening buffer in the screening room, highlighted by the first red line. The second red line indicates when prep changes were implemented. The backlog line continues to fall but now at a more acute gradient, showing that the improvements in prep had a significant effect on work flow within the laboratory overall.

Utilising the prep room to its full capacity was made a priority to meet the turn around times.

Before prep room changes:

- Work came out in large batches at random times of the day, often too late to be screened on the same day (see the graph on the next page).

After the improvements:

- Work leaves in small, manageable batches throughout the day, increasing workflow and putting less pressure on office staff.
- Daily output of trays increased by 15%, from 23 to 26.

Ideas tested which were successful

- Continued cover of the prep room throughout the day - the creation of senior MLA posts enabled this to happen.
- Implementing Kanban within the prep room to decrease errors and promote standard working regardless of who is working in the prep room.
- Removal of second check.
- 5S of prep room and labelling of inflammable store to reduce wasted time and movement when prep staff are locating chemicals (this also aided work on stock control).
- Changing chemicals on the staining machine twice daily at a set time, instead of every five racks (this was suggested by one of the new prep staff after observing time wasted on unnecessary changes).

Ideas tested which were unsuccessful

Keeping the prep room covered from 07:00 until 18:00 meant a number of people working in the prep room throughout the day. Most had their own way of doing things which initially led to problems and mistakes. This was countered through the implementation of standard work and visual management (Kanbans).

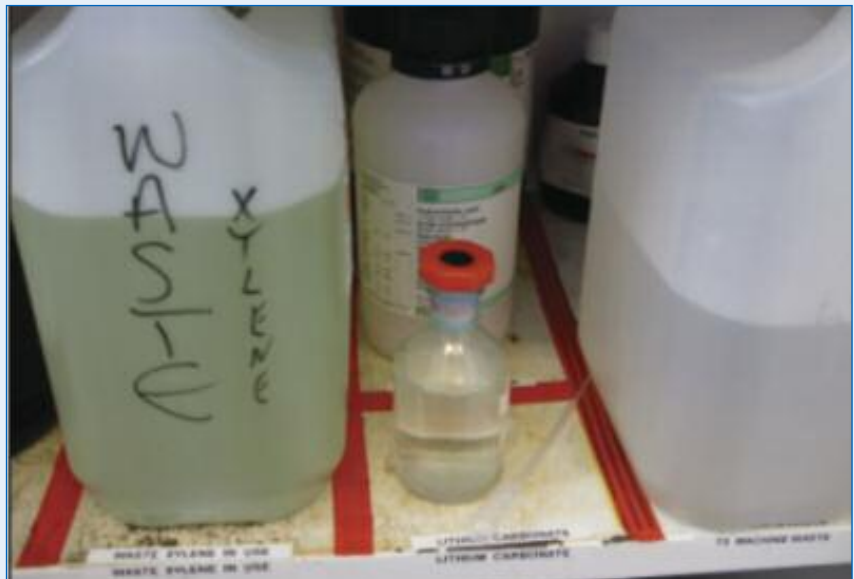
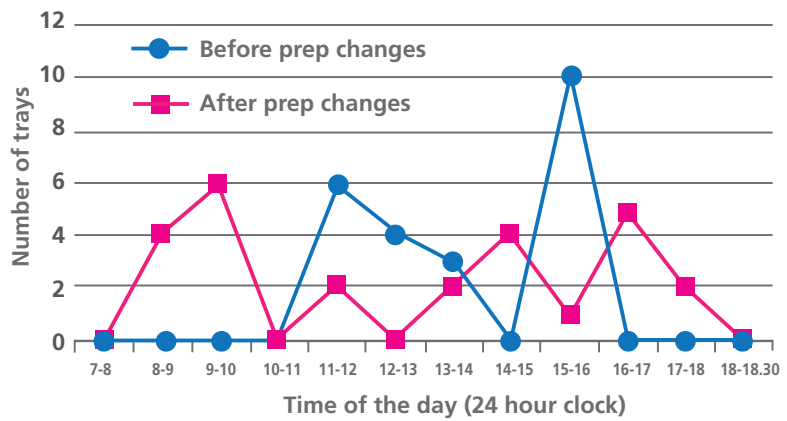
How will this be sustained/potential for the future/additional learning?

- Expanding the number of staff with prep room competencies adds to sustainability in the long term.
- Continued integration of senior MLAs into lab and processing procedures will free up further screener time.
- The next step is to introduce a formal processing timetable to further improve workflow.

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Record of trays leaving prep



Case study 16

Abnormal pathway changes

Norfolk and Norwich University Hospital NHS Foundation Trust

Summary

At the start of the project, the team reporting cases referred from checkers consisted of five pathologists.

Following the appointment of an advanced practitioner in June 2009, the team was reduced to the AP and three pathologist.

The turnaround time from the checker sending the case to the pathologist to the report being authorised has reduced from an average of 3.9 days to 1.7 days.

Understanding the problem

The baseline SPC for TAT evidenced a wide range of reporting times, with a significant number taking several days more than the other samples.

Analysis of these outliers showed that the majority were abnormal samples and many of these had required an HPV test (carried out twice weekly in Bristol). In order to keep within the 14 day target and allow for the additional days required to get an HPV result, it was obvious that the pathologists' step in the process had to be improved.

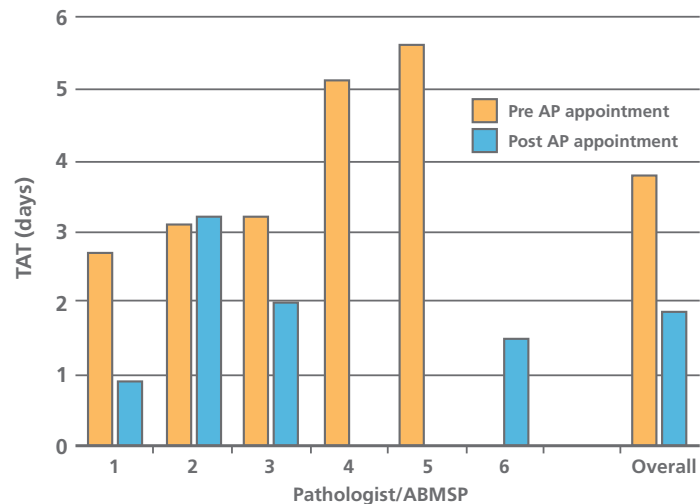
How the changes were implemented

In order to decide the optimum team size, various facts were taken into account including:

- Anticipated pathologist workload based on the workload of the lab.
- Minimum annual requirement of 750 cases per pathologist.
- Number of pathologists needed to cover annual leave and other duties.

Of the five pathologists, two had a significantly longer TAT than the others. The range of average reporting times within the team was 2.7 – 5.6 days. Two were invited to leave the team enabling them to use the released time to deliver in other areas of the cellular pathology service.

Average reporting times of pathologist/ABMSP



Pathologist / ABMSP reporting TAT for all reports:

	5 Pathologist	Overall	3 Pathologist & ABMSP	Overall
Average TAT (days)	2.7 – 5.6	3.8	0.9 – 3.2	1.7

Measurable outcomes and impact

- The average TAT for reporting by pathologists and the AP is now 1.7 days, ranging from 0.9 – 3.2 days.
- The TAT for samples not requiring an HPV test is on average 0.5 days and for those requiring an HPV test is on average 6.8 days.
- The number of outliers is now reduced. The few remaining outliers are those requiring HPV testing which adds three to six days to the TAT depending at which part of the week the sample is received.
- This has not only improved the % achieving 14 day TAT to 99% for September 2009, but has also eliminated the time wasted by senior staff chasing up unreported cases.

Ideas tested which were successful

The decision to reduce the pathologists team was made in order to address the fact that most of the pathologists had not achieved the 750 minimum target the previous year and that an AP was being appointed.

How this improvement benefits patients

The TAT for virtually all samples requiring a pathologist opinion is now within 14 days.

How will this be sustained/potential for the future/ additional learning?

The quality of the service has improved with a reduced TAT and less variability. The smaller team is easier to organise and it is easier to track where samples are, so that senior staff time has been saved.

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12. A3 thinking for problem solving

An A3 is a one-page, A3 size document that records the agreed problem statement, it's analysis, potential counter measures and the action plan to resolve.

The report template serves as a guide for understanding a problem, identifying the point of cause and eventual true root cause in a systematic way. It serves as a collaborative problem solving tool.

Beginning with a consensus on the problem or issue you are trying to solve, the left hand side of the page is completed to document the current state. The right hand page is the innovative or experimental approach to solving the issue towards the future state.

Since Lean is primarily the description of a methodology to routinely solve problems everyday to ensure that the daily work is delivered to specification, A3 thinking is the rigorous application of the plan, do, study, act (PDSA) approach.

It is the structured 'thinking' that is of most importance – the A3 report is of no significance in the absence of structured, agreed understanding and thought processes.

Describing the entire process – from current state, through analysis to future state on a single sheet of paper requires concise information. Creation of an A3 necessitates logical discussion and thinking – with ultimate agreement on experimentation to seek a better way forward. Distilling the information to only the most relevant details for communication to the rest of the team ensures that a thorough understanding of the issue has been attained.

A precise A3 report prevents massive amounts of information being misinterpreted and inappropriate conclusions being reached by a multitude of staff. The best A3s convey the understanding of the problem, and analysis without any explanation. Often, a graphical or pictorial representation of the issue at hand is better than a text summary.

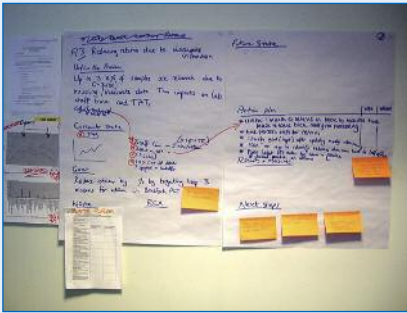
The A3 report represents a shared understanding of the consensus of opinion on solving the problem and should initially be completed in pencil allowing alterations to be made. As a document, it encourages reflection on the learning that has taken place and ensures that a consistent message is able to be discussed and scrutinised. Ultimately, it allows the team to ensure that an agreed action plan is followed.

The A3 report	
Title:	Version: Author: Date:
Problem:	Proposed countermeasures:
Current condition:	Plan:
Target condition:	
Root cause analysis:	Follow up:
Responsible: Team members	Agreed by: Date:

Case study 17

Using A3s for problem solving

The Leeds Teaching Hospitals NHS Trust



Summary

A3s provide a problem solving approach that ensures the user gets to the true root cause of problems and issues. They are simple, visual, engaging and everyone in the team can understand and get involved.

Understanding the problem

The team had made great progress in reducing end to end TAT from 29 to 10 days in a period of 10 months. They knew however that they could reduce this even more but were not absolutely sure what to tackle next.

How the changes were implemented

- The team had previously created 14 and seven day pathways showing ideal future state for the end to end process (from sample taken to result reported). They revisited these pathways (ticking off their successes!) and identified the steps of the process that still needed work.
- With a meeting with one of their PCTs imminent they chose to focus efforts on returns (receiving samples and/or forms with incomplete or poor quality information).
- The national improvement lead explained how an A3 would help the core team to really understand the problem and its root causes as well as engage and involve both their own wider team and the PCT so, they took a blank piece of paper and were off!
- They began by clearly stating what it was felt the problem was. This wasn't as easy as they thought it would be! It was understood at a high level that the problem was

taking up time in both the lab and the office. They also knew that returning samples added days to the time taken to report results back to the woman.

- The team weren't able to complete the whole A3 document in one go and began to realise that was the whole point! The first step was to quantify the problem. This is important to make sure that the problem is as big as first thought and is worth the time investment to solve.
- Soon after starting their A3, the team stopped to 'go see' what happens in the lab when a sample is received that needs to be returned. They then created a value stream map of all the processes in the lab (and the ones they hadn't at first thought about in the office) and timed each of them. This told them they definitely had a problem worth solving!
- The team also agreed that they needed to gather data on the length of time before sample takers correct the data and return the samples to them (because this is the major impact on TAT and the length of time it takes the women affected to get their result).
- After an hour or so of work the team had a list of six actions that would make sure they really understood the size of the problem before moving on to root cause analysis.

Measurable outcomes and impact

In around 40 minutes the team were able to establish that what they thought was a problem was actually wider reaching than first thought, was well worth addressing and they had started to quantify the possible gains.

Ideas tested which were successful

- The team have posted the A3 on the wall where they have their Monday huddle. This huddle is a little longer than other days and now the whole team are involved in this problem and are invited to add their thoughts on post-it notes.

- The team have not solved their problem yet but are convinced that the A3 is the right tool to take them to the solution and they will be using the same approach for the other gaps in their future state plan. The A3 brings together all their Lean learning, provides them with a robust framework, keeps everyone involved and engaged and is a living document that provides a constant visual focus.

Ideas tested which were unsuccessful

The initial idea for tracking the time taken for returned samples to come back was looking back through the returns book and tracking individual samples back through the system. It was decided that this would be too time consuming. The prep lab PC was due for replacement so a spreadsheet has been created so all information is entered directly, removing the need for a manual book.

How this improvement benefits patients

A3s have provided the team with an efficient, focused problem solving tool that will facilitate continued efforts to reduce the time taken for the 100,000 samples screened ensuring women receive their results earlier.

How will this be sustained / potential for the future / additional learning?

By creating A3s on flip chart paper and posting them on the wall the core team can involve the whole lab' team and their PCTs in problem solving. They will also maintain a typed up soft copy so that they have a lasting record of their work.

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13. Root cause analysis

The most obvious contributor to any problem is rarely the root cause.

An effective problem solver uses A3 thinking to investigate an issue until they identify the one cause that, if dealt with, would eliminate all future occurrences of the problem in hand.

All process problems result from either:

- 1. a poorly specified activity**
- 2. an unclear connection**
- 3. a complicated or undefined pathway**

It is imperative that countermeasures are designed to prevent repeat episodes of the same problem without the necessity to perform a 'workaround' solution.

Finding the root cause may require some experimentation. A useful method for identifying the root cause of a problem is the five whys deductive technique – literally asking 'why?' five times until final causality is established.

Alternatively, an Ishikawa or fishbone diagram might be useful but the repetition of asking 'why' forces critical thinking to challenge each cause-effect relationship.

The goal of the 'root cause analysis' section of the A3 report is to show that either experimentation or logical deduction has established the true 'cause-effect' relationship in the current state. Reasoned agreement within the team should separate symptoms and opinions from the true cause-effect and a summary of the main findings should be populated in the relevant A3 report section.

Analysis should be fact and data based. Accurate data/measures should be used as an objective means to identify occurring problems which give rise to deviation from specification requirements. Determining the root cause of these deviations should provide a clear understanding of the necessary solutions.

There are a number of principles to bear in mind:

- Don't assume you know the cause – preconceived ideas will prohibit a useful analysis.
- Always go to the location of the problem and observe it first hand.
- Continue your analysis until the true cause of the issue is identified.
- The goal is always to identify problems that can be corrected by the problem solver.
- A thorough analysis with factual data will indicate the corrective action required.
- Determining the result when the causes are detected is as important as examining the problem itself.

Case study 18

Using data for root cause analysis

Hull and East Yorkshire Hospitals NHS Trust, Hull Royal Infirmary

Summary

Analysis of turnaround data showed unnecessary waiting for delivery to the laboratory, abnormal samples waiting for pathologists reporting and returned samples due to errors in patient labelling.

Following root cause analysis, more appropriate and timely management of problems which had resulted in delays in reporting was instigated to reduce end-to-end turnaround times, including a policy of zero tolerance of defects on forms or samples.

Understanding the problem

It was evident that there were delays along the processing pathway which were resulting in unnecessary delays in reporting of results.

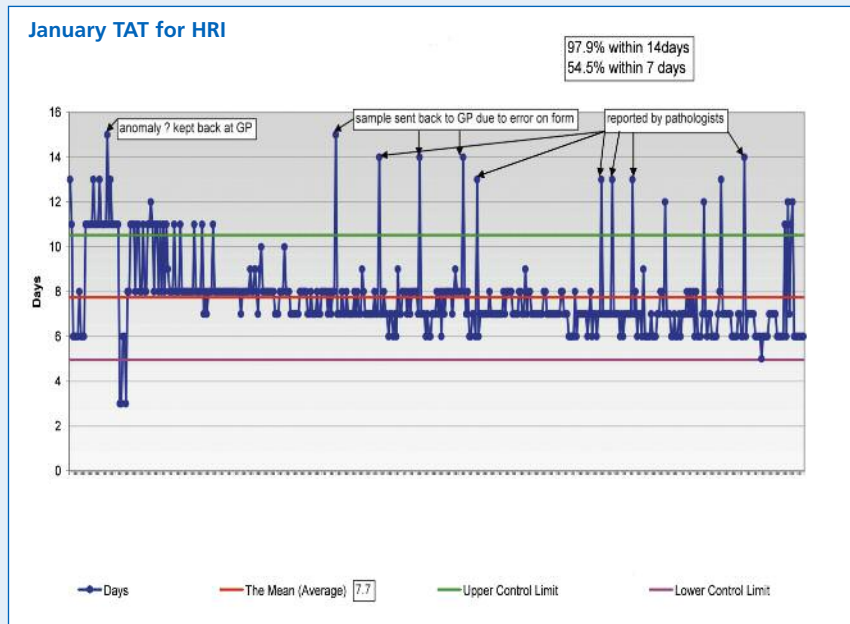
- Samples data was analysed using SPC to identify the extent of any variation.
- The SPC graphs identified peaks which were outside of the upper and lower control limits (three standard deviations).
- Performing root cause analysis on the individual samples outside the upper control limit identified the reasons where and why along the pathway they were being delayed.

This showed:

- **Defects** - samples were being returned due to errors in patient information provided by the sample takers.
- **Unnecessary waiting** - some GP practices were not sending their samples to the laboratory on the day the test was performed.
- **Inventory** - a number of abnormal samples were sitting in pathologist offices waiting to be reported.

Measurable outcomes and impact

- Root cause analysis performed on all SPC charts.
- Identification of outlying peaks highlighted faults throughout the process.



How the changes were implemented

Evidencing delays through data enabled the department to identify root cause and address identified issues.

- The importance of the need to send samples straight to the laboratory daily to avoid delays in the process was reinforced to primary care. Individual practices were contacted by telephone followed by the sample taker mentors and LBC working party members.
- A position of zero-tolerance of any errors was agreed with the trust clinical governance team and all samples with errors were returned to sender.
- A system has been put in place to monitor the volume of work each pathologist receives and their turnaround times. The pathologists worked out a share scheme so that no one pathologist had an unmanageable workload.

Ideas tested which were successful

- **Timely transportation** - the importance of the need to send in samples straight away to avoid delays in the process was reinforced to primary care.
- **Reducing defects** - a policy of zero-tolerance of errors from primary care was also introduced reinforcing the need to provide accurate patient details on request cards and samples sent to the laboratory.
- **Reduced waiting** - closer collaboration between pathologists and a flexible approach to work distribution based on excess capacity was agreed. Visual management systems were put in place to measure 'goal v actual' for the screener and consultant's workload.

How this improvement benefits patients

By understanding the real root cause of the problems, waste has been eliminated, and the process streamlined, resulting in a more efficient service provision, both in time and quality for the benefit of all service users.

How will this be sustained/ potential for the future/ additional learning?

- Identification of wastes has enabled the team to put in place measures which have made other service providers accountable for their part of the patient pathway.
- A better record of sample accuracy on receipt in the lab has been achieved resulting in less time wasted on corrective measures, with the associated cost implications.
- The monthly monitoring of samples using SPC will be incorporated into working practice after the pilot project ends.
- All of this has allowed the laboratory to forge closer links with other agencies within the patient pathway.
- Pathologists are more aware of the need to maintain a constant flow of abnormal reporting in line with requirements to meet the 14 day TAT and so have adopted a more flexible approach in order to accommodate demand.
- The changes have resulted in the elimination of waste within the process which has benefited staff by improving morale

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14. Visual management

Visual management is everywhere, from traffic lights, to the numbers on the front of buses, petrol indicator lights in cars, a water level on a kettle, or a cricket scoreboard.

These visual indicators allow us to easily understand the situation and take action where necessary.

Visual management is a simple, yet highly effective way of indicating what should happen (by setting a standard) and what is actually happening in the work environment. At a glance, colleagues, supervisors, managers and visitors to the area should be able to understand the process and see what is under control and what isn't without asking a single question.



Visual management allows teams to:

- **see the work in progress;**
- **recognise flow stoppers;**
- **assess inventory levels;**
- **identify defects;**
- **see deviations from the standard;**
- **enable interventions.**

There are two types of visual management:

- **'Visual display' is the provision of information;**
- **'Visual control' is associated with action.**

Both provide the maximum amount of information without having to leave the work environment or interrogate an information system such as a spreadsheet or database.

Visual management provides knowledge, certainty and makes our life, and those of our patients, safer.

You can use visual management to answer, amongst others, the following questions:

- **Are we up to date with the work?**
- **How much work is in the system today?**
 - How many samples/ slides/request forms are in the laboratory?
 - How many letters have we processed today?
 - How many mismatches were there in recall?
- **What are our three biggest problems in the area and what is being done to resolve these problems?**
- **How do staff know that their ideas have been listened to?**
- **Who is trained to perform each task?**
- **Is there daily responsibility for supervision? Who is it today?**
- **How do you know where staff are – break, annual leave, study leave?**
- **How do you know if the stock has been ordered?**

Case study 19

Use of visual management to support a zero tolerance of defects

Taunton and Somerset NHS Foundation Trust

Summary

There was a 4.75% defect rate in cervical cytology samples prior to the project, mostly from substandard request form completion and sample labelling. A total of 1.2% of all samples were returned to the sample taker for correction.

This problem caused a variety of wastes, mostly of staff time:

- Specimen transit time - up to three weeks to get the specimen back from the sample taker.
- Sample taker time – managing the return.
- Senior cytology staff time – responsible for organizing the send-back process.
- Patient time – some of the serious defects required retesting for the patient.

A series of changes to the way request defects were handled had the aim of reducing time spent managing the defects, reducing the number of women whose result is delayed by the send back procedure and reducing error and clinical risk.

Understanding the problem

Poor quality sample and form data was being received from sample takers, resulting in significantly increased turnaround time or inability to perform test.

The problem was identified from:

- Audit of telephone calls (performed as part of quiet time initiative).
- Incident reports involving poor sample and form data quality.
- Audit of discrepancy request flags on laboratory computer system.
- Root cause analysis (five whys) of delayed samples which were highlighted as outliers on SPC charts.

How the changes were implemented

Visual management information sheets were produced and sent to sample takers. All visuals were also loaded onto the cytology pages within the pathology intranet site so that users can print off extra copies as required.

Taking a cervical cytology sample?

Then please use these



Then send to cytology department

Taking a cervix biopsy sample?

Then please use these



Then send to histology department

Send-back policy change

- Sample takers were informed of policy change three months before it was actioned.
- Change in policy reminders were sent out with each defect returned during same three month pre-implementation period.

Following the three month testing period

- Minor discrepancies are now recorded but not sent back to sender.
- Major discrepancy samples are discarded and the sample taker informed.
- New cytology 'send-back' section has been added to laboratory system to record major discrepancies and produce standard report for GP/sender.

Measurable outcomes and impact

The effect on the turnaround time of these changes cannot yet be calculated because the team were still working through a backlog generated by an increase in demand earlier in the project.

However, there have been tangible impacts elsewhere

- Improved communication with sample takers.
- Large reduction in the number of major defects received.
- Effective use of senior staff time impacting on turnaround times elsewhere in the specimen journey.
- Saving in staff time within specimen reception/prep with a significant improvement in staff morale.

- Saving in consumables used for packaging and in transport costs.

How this improvement benefits women

- Minimising defects in patient identity details reduces clinical risk.
- Over 500 women each year no longer suffer a delay of several weeks waiting to receive their result due to send-backs.
- Improvement in overall specimen turnaround time for all 50,000 samples screened annually due to:
 - Smoothing flow in specimen reception and prep.
 - Re-allocation of seniors to more appropriate roles.
 - Decreased telephone calls to and from practices correcting defects.

How will this be sustained/potential for the future/additional learning?

- New send-back section added to laboratory computer
- Ongoing use of visual management for sample takers.
- Better informed sample-taking staff.
- Standardisation of work practices involving defects.
- Quality system for recording major discrepancies.
- Process reinforced as part of routine sample taker training and update sessions.

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Case study 20

Introduction of yellow stickers for the abnormal pathway

Ashford and St Peter's Hospitals NHS Trust

Summary

The use of visual management to ensure 'abnormal' cases achieve the 14 day TAT, has reduced the turn around time for 50% of cases to less than six days

Understanding the problem

- Analysis of SPC charts showed that the majority of the reports that missed the two week TAT were abnormal results.
- The abnormal results were taking longer as they needed more checks and to be checked by a consultant.
- The consultants were not aware of first in first out. There was a need to help them prioritise, making demand, and therefore turnaround times visual.

How the changes were implemented

From May 2009 a yellow sticker was added to the forms for positive cases stating the date by which the form would be required back into the office.

Consultants agreed to return positive cases within seven days enabling achievement of the 14 day turnaround time.

However, the SPC chart evidenced that significant enough gains had not been made.

Measureable outcomes and impact

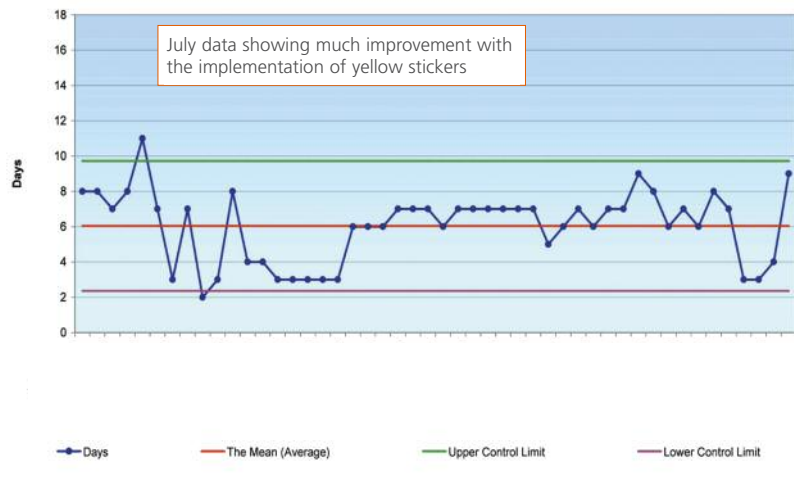
The agreed seven day turnaround by consultants was not fast enough to enable achievement of the 14 day target so after further discussion the timetable was reduced to three days.

As a result, some of the positives are now turning around within seven days with the remainder meeting the 14 day target.

Ideas tested which were unsuccessful

The first steps in improving work flow involved giving consultants a small quantity of abnormal results on a daily basis rather than waiting until a tray had been filled.

TAT for abnormal results - July 2009



This change alone was not enough to reduce the time taken and work continued to be batched by consultants before it was returned.

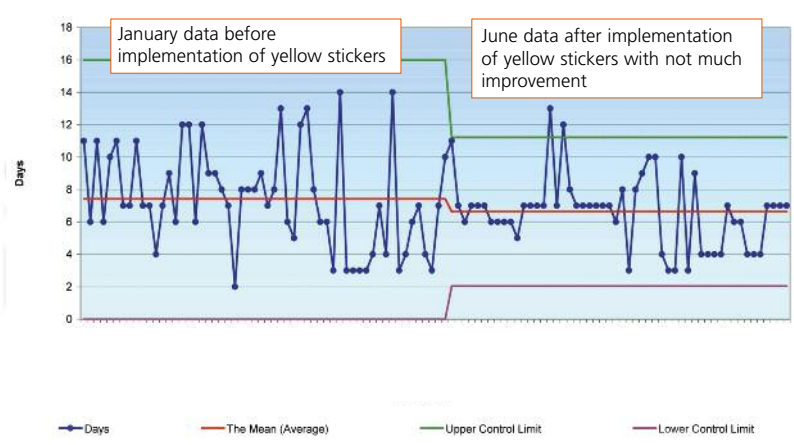
How this improvement benefits women

The changes made have contributed to the overall reduction in turnaround times.

How this improvement benefits the organisation

Changes will be sustained through daily monitoring of the incomplete list and keeping the consultants and APs involved in delivery of the TAT targets. The stickers will continue to be useful as the team strive to achieve the seven day turnaround for abnormal results.

TAT for abnormal results - Jan/June 2009

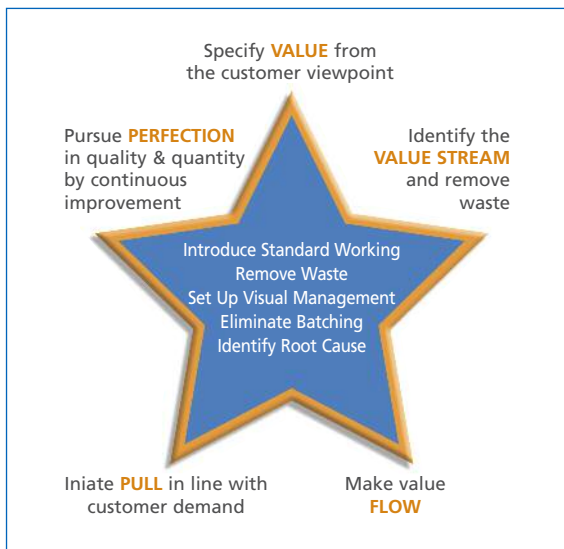


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15. Value, value stream mapping, flow and pull



- Lean starts and ends with the customer. In our case, the woman or another department involved in that woman's journey.
- A value stream map is used to describe all activities performed and information required to produce and deliver the product or service.
- Whether a step is 'value add' is determined by the woman.
- To ensure value in a process, focus on improving flow, creating pull and striving for perfection.

What is a value stream map (VSM)?

This tool captures and specifies the activities, information and timing in the process. It differs from a process map in that it includes waiting times and inventory (backlogs) between steps and the number of people involved at each stage in the process.

It should ideally be a hand drawn representation of how all the steps in a process line up to deliver a service. As well as the flow of information that triggers each step of the process into action, it includes the flow of materials and the flow of information.

The steps in the process are timed and categorised as value-added and non-value-added.

Teams will create more than one VSM. The first should show the current state (the way things are now). A subsequent VSM should be created

to identify the 'ideal' or 'future' state; the idealised notions of the process in a perfect world, where all the steps are only value added steps.

As improvements to current processes are made the current state VSM should be updated.

Why do we need a VSM?

The purpose of a VSM is to:

- Provide the customer (woman) perspective and keep focus on delivering to their expectations.
- Provide a complete, fact-based, timed representation of the activities required to deliver a service.
- Provide a common language and common view to analyse the value stream.
- Show how information flows to trigger and support the activities.
- Show where activities add value and where they don't.

How is a VSM created?

A VSM should be created to represent what is actually happening rather than what should be happening. The best way to capture the steps that a sample or woman goes through is to 'go see'; do a 'Gemba walk' meaning to go to where the process happens and observe what actually happens and how long each step takes.

In order to understand and analyse the process you will need to capture certain information including cycle time, changeover time, inventory (backlog) levels and the number of staff carrying out the task.

Every step in the value stream needs to be understood by asking:

- What is the actual time required to perform the task in the process step?
- What is the waiting time before each step?
- What is the transport time?

A VSM should also include a representation of information flow. This is critical to the timely and effective execution of the process. Location, quantity and frequency of information flow should be shown.

To identify this detail, ask these questions:

- What information is being transmitted?
- When is the information being sent?

- Who receives the information?
- Where within the value stream is the information transmitted?
- Is the information sent manually or electronically?

Lead time

This is the amount of time it takes for one piece (sample) to move through the whole process from start to finish. It includes transport, process time, waiting, etc. It should be from the time the woman has her sample taken until she gets the result letter. Lead time includes value added (VA) and non value added (NVA) activities.

A VSM includes a continuous line along the bottom representing the lead time for each step. The line looks like the turrets of a castle with each turret being the time it takes for each step to be performed and the gaps between turrets being the waiting time.

Quantifying and qualifying value added (VA)

Steps in the process should be described as value added (VA) and non value added (NVA).

Non value added steps can be further subdivided into:

- Non value added but necessary
- Non value added and not necessary.

Value added processes or activities must meet three key criteria:

- The customer (woman) must be willing to 'pay' for it. Payment is generally thought of in monetary terms but could include time or other resources.
- The activity must transform the product or service in some way.
- The activity must be performed correctly the first time.

Anything that does not meet the above criteria is non value added (NVA) and is, therefore, a waste of some type.

Flow

Flow refers to the creation of a steady stream of products or services to the customer.

The ideal state is that, from the time the process starts, the sample never stops until the result reaches the woman. To achieve this ideal state,

samples would have to flow through the process one at a time with no excess inventory, no defects, no rework and no equipment break downs.

The only way that we can get close to this ideal is to apply standard methods of working with minimal variation and to reorganize work environments.

Flow is difficult because it doesn't fit with the natural way humans think. We tend to organise things into batches because we think it is more efficient.

In single piece flow documents and samples are handled less, use less space and are completed more quickly. Single piece flow is not achievable in a laboratory environment but batch size reduction has achieved proven time savings.

Pull

Pull and flow work in harmony with one another to keep the entire value stream moving at the rate that is required by the woman.

Lean uses level scheduling practices to keep the system operating at a steady achievable pace. One of the most common examples of a pull system is a supermarket where only the specified amount of a product is placed on a shelf. When the product level runs low, the empty space acts as a signal for the stock person to replenish the product.

In a laboratory the pull system should be driven by the customer (woman) demand which signals all the activities upstream to build or replenish what has been used. Upstream activities are not initiated until a signal from the steps downstream is received.

Instead of building up an excess of samples at any step in the process, work should be performed only when the sample is required downstream – a 'take one, make one' system.

When successfully implemented in conjunction with flow and perfection, pull systems result in less inventory (backlog), reduced floor space and faster processing of samples.

Case study 21

Removing duplicate checks

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

The adequacy check prior to primary screening was removed. This step had been originally introduced to technically monitor the T3 Thinprep processors and provide an early alert process for inadequate preparations, requiring reprocessing. The elimination of this step removed waiting and over processing releasing **61 hours staff time annually** for other duties and the slides are now available for screening sooner.

Understanding the problem

- A visual and microscopic check of prepared slides was done on all slides prior to leaving the preparation room for primary screening. This task took additional time and delayed the slides. The value and point of the task was questioned - why was it being done?
- The laboratory became involved in a GMEC Analyser monitoring programme, recording adequate/suboptimal preparations. The QC check was necessary whilst participating but the value of the step was questioned after the trial ended. The QC check involved a visual evaluation of all preps, often leading to a further microscopical check, prior to being available to the primary screener. This task took additional time and delayed the slides being available for screening.
- It highlighted that there was considerable variation in how the task was carried out despite the existence of the SOP. There was a lack of consistency in applying assessment parameters and criteria with varying outcomes.
- Discussion by the senior team agreed the purpose and standard procedure of the task. The task was to identify slides with large patches of material missing which required reprocessing to produce a suitable slide for screening. A green mark was placed on these slides as a

visual indicator. Over time this check had become (for some staff) an assessment of overall adequacy rather than an assessment of one particular problem.

- Assessment was then needed to quantify the slides involved and whether there was an unnecessary overproduction; if the assessment was not being applied consistently did it have any value?

How the changes were implemented

- The number of slides processed during February 2009 was 5,622; of which 62 were reprocessed, 1.1% of the total.
- A review was carried out to re-evaluate the 62 slides which had been marked as requiring reprocessing, to determine whether they did actually fit the agreed criteria for another slide to be made. The slides were reviewed by two people using clearly defined criteria to assess whether the first slide was adequate and whether the second slide therefore had an added value.
- Only 16% (10 of the 62) samples were unnecessarily reprocessed.
- Therefore of the 5,622 samples examined under this check only 52 – 0.95% actually required further action. The 14 minutes per day spent on this task was out of proportion to any value of identifying reprocessing on minority of samples.
- The step was therefore eliminated.

Measurable outcomes and impact

- Over processing step removed.
- Waiting removed.
- Over production reduced
- Time saved: 14 minutes per day

Ideas tested which were successful: Audit using clearly defined criteria and parameters and endpoint is a useful tool to make decisions. Reliable data is key to making informed decisions when changing or removing processes.

Ideas tested which were unsuccessful

The initial assessment of the problem did not use clear evidence and there were different opinions as to the value of the step.

How this improvement benefits women

The slides will be available for screening quicker and therefore the TAT reduced. Staff time released for other duties, cost of consumables not used in over processing.

How this improvement benefits the organisation

Recognition that deviations from the SOP occur over time and staff should be reminded to keep to them. Standardisation is key with clear unambiguous instructions and understanding of the task to ensure it is consistently carried out.

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Case study 22

Establishing work cells

Hull and East Yorkshire Hospitals NHS Trust, Hull Royal Infirmary

Summary

A work cell was established to reduce motion and batch sizes and maintain workflow in the laboratory by moving data entry from the office into the preparation room.

This also addressed the concerns and anticipated increase in defective returns to primary care due to the implementation of a zero-tolerance policy for errors.

In addition, approximately **nine miles per annum** of wasted walking has been saved.

Understanding the problem

A review of the current state value stream map identified that data entry, sample sort and check could be combined.

Sample forms and vials were cross checked by lab staff for matching purposes in the specimen reception area of the prep lab and the vials loaded in order onto processing trays. The request forms were then taken for data entry into the office.

Where a discrepancy was picked up that warranted the sample being returned to sender, the corresponding vial then had to be retrieved from the tray, and all the vials moved along to fill the gap.

- The anticipated increase in returns due to the implementation of a zero-tolerance of errors meant that it was more straightforward if data entry was moved into the processing room to create a continuous flow of work.
- Motion and transport waste was identified..
- Spaghetti mapping showed the number of times a data entry clerk had to walk between the office (36 steps and three doors) and the lab unnecessarily.

- Keen to streamline the data entry process to a one at a time throughput.
- Inventory ~ samples waited pre analysis between receipt and data entry causing unnecessary batching.

How the changes were implemented

- Moved data entry into preparation room. This required a computer terminal, label machine and relocation of office staff.
- Standard work was introduced requiring the sample to be checked by the data entry person before the vial was separated from the form.
- Data was entered immediately after sorting and checking and the sample loaded to the rack for analysis.
- Any defects (mismatches/incomplete information) were put into a 'red bin' and dealt with later in that session – so maintaining flow.
- This enabled reduced batch sizes and increased flow.
- This was a massive change for staff as teams were brought together in the work area, and data entry clerks were moved to a clinical environment.

Measurable outcomes and impact

- **0.75 miles** walked per month saved.

Ideas tested which were successful

- Established work cell – sample checking, data entry and LBC analysis.
- Value stream mapping and spaghetti mapping tools defined the extent of the problem.
- On going data collection of defective samples received.

How this improvement benefits women

Reduced process time and hence turnaround-time for all samples.

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Case study 23

Standard work and flow at late delivery times

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

Creation of flow and standard work enabled the laboratory team to manage a change to the delivery schedule. This included overnight processing to create availability in the early morning for screening.

Understanding the problem

Deliveries of samples are received several times during the day from different sources. The main bulk of samples were previously received at lunchtime, unpacked, processed and stained.

The department was notified that the time for this main delivery was to change to late in the afternoon to meet demand for sample collection to other pathology disciplines such as blood sciences.

This presented a problem for cytology as there are less staff available in the late afternoon to receive, unpack and process. The team were concerned that some samples would not be processed until the following morning or staff could be needed to stay late in order to get all the samples unpacked and onto the T3000 machines for processing.

They investigated the following before taking action

- What time were the delivery times actually going to be and would they be consistent?
- How many samples would be on the delivery run?
- How quickly could the samples be unpacked, labelled and got onto the machine without an increase in the defect rate?
- How many people would be needed to do the task?

Data was collected before and after the changes in delivery times on how many samples arrived in each delivery. There has been a shift to a greater number of samples being received later in the afternoon.

The team were asked for their views and suggestions for how they might manage this change in work flow.

How the changes were implemented

Two approaches were tested:

1. Four people worked in pairs. One person opened the specimen bags and did a quick check of some patient demographics. The second person did a full demographic check and put barcode labels on the forms and vials.

There was the potential for mismatch errors as there were separated forms and vials lying on the bench and other people were then picking them up. There was duplication of the checking part of the task.

The space was limited and therefore crowded with four people working in the same area. It was also noticed that lab accession numbers were not being used in order. The work got done in a short time but on observation the process was rushed and chaotic.

2. The second change was to instigate a first in-first out (FIFO) approach to the unpacking process and have a one piece flow of standardised work.

The bench area for the unpacking process was relocated and redesigned to give separate spaces for each of two staff to work side by side.

Each person took a sample and did the complete task - remove from the bag, check the patient demographics and label the forms and vials with barcodes before placing in a processing tray

Measurable outcomes and impact

- The samples are unpacked and ready for processing without the need for additional staff to help with the task.
- The increased number of samples being delivered later in the day has been managed.
- Samples are processed overnight and are ready for staining at lab opening the next morning.

- The staff initially pulled in to help can continue with other tasks (primary screening and QC) and so more samples are authorised.
- Staff have needed to stay late only occasionally and for a short time and therefore the impact on them has not been as great as was initially feared.

Ideas tested which were successful

Standard work with steady, one piece flow got the work done in the same amount of time with half the number of people it had been thought necessary. No additional resources have been required.

Ideas tested which were unsuccessful

Leaving some samples until the next day was suggested. This would add at least a day to their TAT and was rejected. The samples need to be on the processing machines so they can be stained and screened the following day.

The first approach to managing the peak work arrival introduced the potential for mismatch errors and introduced duplication of steps. The work was rushed.

How this improvement benefits women

Women can attend a screening appointment later in the day without adding extra days before receipt of their result letter.

How this improvement benefits the organisation

Further work is required on standard work for the unpacking process as two different approaches have evolved from the initial model.

The team are measuring the time taken and defect rate for each method and assessing which has the best time/quality outcome.

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Case study 24

Abnormal pathway changes

The Leeds Teaching Hospitals NHS Trust

Summary

The results of abnormal samples were being authorised on average 10 days after negative samples.

As a result of the changes made abnormal results are now issued 1 day after the negative results with an associated time saving equivalent to 47.8 working days per year.

Understanding the problem

- A delay in the system for checking and reporting of abnormal samples was causing a delay in authorizing results on abnormal samples.
- The turnaround time for negative and abnormal samples, recorded on a weekly basis, highlighted the issue.
- Analysis of the processes showed that the main cause of the delay was the waste of waiting.
- After primary screening samples awaited separation of negatives from abnormal. At this stage an extra QC step was performed, correlating the pre-screening and primary screening results.
- After separation, the potential abnormal/abnormal cases were placed in a checking box for senior staff to screen.
- After checking, the abnormal cases then were taken to the reporting room to wait reporting by a pathologist/ consultant BMS.

How the changes were implemented

- Primary screeners now separate out their own potential abnormal/ abnormal cases.
- The extra QC step has been removed.
- An outstanding list is now run frequently to ensure that no discrepancies between pre- and primary screening results are missed.
- A seniors' rota was implemented to assign the role of checking to specific people on a daily basis.

Reporting times (days)

Week	Negatives	Abnormals	Difference
1	18	27	9
2	17	27	10
3	14	21	7
4	13	18	5
5	12	13	1

- A scheduling system was introduced where fixed quantities of slides are sent to the reporting room at set times of the day in line with capacity/demand.
- Daily communications between the first checker and pathologist/ consultant BMS are used to balance capacity and demand.
- A pathologist/consultant BMS rota was introduced to maximize reporting capacity.
- Deviations from the norm are monitored daily, discussed at huddles and counter measures put in place if required.

Measurable outcomes and impact

- Turnaround times for abnormal cases are now only one day more than for negatives.
- Removal of the extra QC check has saved 85 minutes per day, an equivalent of 47.8 working days per year.

Ideas tested which were successful

- In the past the screeners did separate out their own abnormal. However, this was changed several years ago when pre-screening was introduced.
- After a buddy event the team looked at the process again and decided that running the outstanding report would provide the required QC check and release 85 minutes per day.

How this improvement benefits women

Approximately 5% of cases reported have an abnormal result. At current workload this equates to 5250 women receiving their result up to nine days earlier than before.

How will this be sustained/ potential for the future/ additional learning?

- The changes have had a significant positive impact on service provision without compromising quality.
- In future the adverse effects of QC checks will be considered as well as the benefits.

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Case study 25

Changing work patterns

Pennine Acute Hospitals NHS Trust

Summary

Individual screeners are no longer leaving unfinished batches of work on their desk until their next working day and less work is outstanding at the end of each day, resulting in an improved TAT for delivery to recall by one day. In addition, results entry and authorisation now occurs on the same day.

Understanding the problem

- Part-time screeners working mornings left any unfinished batches of slides on their desks to be continued on their next working day.
- This pattern of work could delay as many as 66 (220 when using large batch sizes) slides per day depending on the number of staff working. This represented approximately 30% of daily screening workload.
- Slides that had been screened and entered on to the computer system were placed on the shelf for a second person to rapid re-screen. These slides were often left until the following day which delayed reports going over the electronic link to the screening agency. If this scenario occurred on a Thursday, then the reports would not arrive at the screening agency until Monday morning, adding three days to turnaround.
- Screeners had individual preferences for which time of day they would complete rapid reviews.

How the changes were implemented

- It was agreed that screeners would work on a first-in-first-out basis and that everyone would complete one tray of primaries immediately followed by rapids and so on through the day.
- Part-time staff were asked to place any unfinished work back on the shelf for screening when they finish for the day. These slides are placed on the top of the pile so that they are taken first. This ensures slides are screened in date order.
- Any slides from a part completed batch that had been primary screened were passed straight for rapid review (rather than being returned to the shelf with the unscreened slides).
- Staff who work to the end of the day in the department take the incomplete trays of slides and complete them.
- Slides that were being left on the rapid re-screening shelf overnight are dealt with the same day so that they are not delayed until the day after. A cut off point at which all staff would switch to rapid reviews was agreed to ensure the maximum number of results being captured by the daily download.

Measurable outcomes and impact

- All slides with results entered on the computer on a given day are authorised the same day.
- Time taken for the results to reach the screening agency is reduced by one day to three days.
- Changing working patterns have not had a detrimental impact on safety (defects) or quality.
- Morale – changes were accepted and are seen to contribute to an improvement in service.

Ideas tested which were successful

A jumpstart event identified this change as a 'just do it' opportunity.

How this improvement benefits patients

The number of cases outstanding at the end of the day has reduced by 50% and enabled all reports to be sent in the order in which they were received reducing variation in our turnaround times.

How this improvement benefits the organisation

Similar systems are used to ensure that the number of cases transmitted to the call/recall agencies are maximised when multiple downloads are implemented.

So far, focus has been on preventing screening carrying over from one day to the next. The team will now develop their thinking to find a way to prevent cases carrying over to the following days download. Multiple daily downloads will become the driver of a pull system.

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16. Future state mapping

Whilst the current state VSM is a snapshot of where you are and what your service looks like now, it is important to articulate where you are going - **your future state**.

A future state map can either represent what your 'ideal' service would look like, with only value added steps, or a more realistic state. The latter would be more straightforward to implement relatively quickly through a focussed action plan with SMART goals (specific, measurable, agreed, realistic, trackable).

As soon as the 'future state' is achieved it becomes the 'current state' and a new future state map should be drawn. This is part of the Lean culture of continuous improvement and the principle of striving for perfection.

This approach allows incremental improvements to be made by reducing waste and any non value add steps. Analysis of a value stream map should determine any non value add steps that can be eliminated along with value add steps that can be either combined, simplified or re-sequenced to achieve the future state.

Don't disregard the concept of a future state map showing the 'ideal' service. When people are 'allowed' to let go of current constraints and imagine where everything is right to deliver only value to the customer, radical thinking results and breakthrough opportunities can be identified.

Using the PDSA methodology and measuring before and during improvement activity, ideas can be tested to ensure they make a positive difference to the process.

For more information on value stream mapping, please refer to section 26, websites and useful reading.

17. Using 5S to improve safety and morale

- 5S means the workplace is clean and safe - a place for everything and everything is in its place.
- 5S is the starting point for implementing improvements to a process.
- To ensure your gains are sustainable, you must start with a firm foundation.
- Its strength is contingent upon the employees and organisation being committed to maintaining it.

Note: Unless you are working in a small area don't undertake 5S for the whole department at once. You will overwhelm everyone and you will risk shuffling unnecessary items around, rather than eliminating them. Before you start the 5S process determine the boundary of the area you are addressing. Do not 5S another individuals workspace.

5S is one of the foundations for Lean as it:

- Reduces waste.
- Means less searching and decreases walking and motion.
- Reduces downtime, accidents and mistakes.
- Improves flow.
- Makes better use of space.

It is also a precursor to other tools such as:

- Pull systems/inventory replenishment.
- Standardised work.
- Setup reduction.
- Mistake-proofing.

5S Stands for:

SORT – Separate and remove clutter and items not needed in the workspace. Remember that extraneous items impede the flow of work.

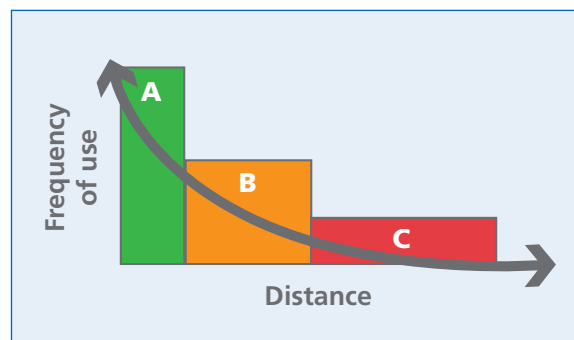
SET IN ORDER/STRAIGHTEN - Arrange and organise all items to minimise movement, make things clear.

SHINE (AND INSPECT) – Clean the area, workspace, storage, equipment, etc. and inspect for warning signs of breakdowns.

STANDARDISE - Create consistency. Identify an area to store 5S supplies (cleaning supplies, labels, coloured tape, boxes and other necessary items) and schedule time and responsibility for restoring work area to the proper condition regularly.

SUSTAIN - Maintaining 5S. Audit the area regularly and expand 5S activity to other areas. To maintain discipline, practice and repeat until it becomes a way of life.

Use this graph as a general guide for deciding where to store items.



Why use 5S at all:

- A clean workplace indicates a quality product and process-dust and dirt cause product contamination and potential health hazards.
- Creates a safer work area.
- Gains space, removes waste and shortens travel distances.
- Visually shows what is required or is out of place and so saves time not searching for items.
- More efficient to find items and documents (silhouettes/labels/shadow marking).

Case study 26

5S in the screening room, office and stores

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

Introducing 5S in the screening room, office and storage areas has saved time as staff are able to locate slides, control stock levels and find what they need quickly.

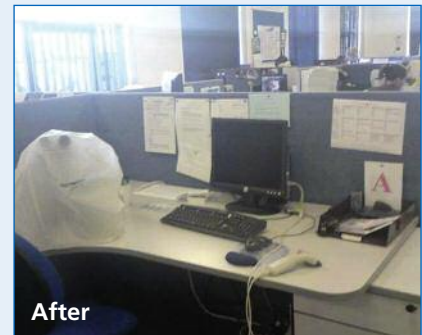
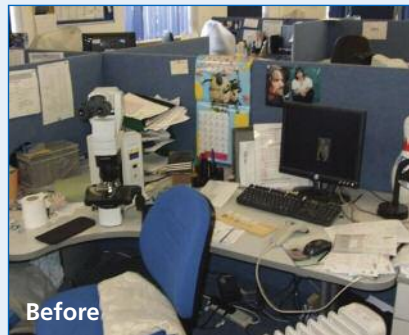
Standard work for where authorised cases are kept on screeners' desks has saved **one to two hours per week** of senior staff time.

Understanding the problems

- Cases checked and requiring consultant authorisation are returned to the screener for feedback. Each screener previously put them in a different place on their desk. One to two hours of senior staff time was wasted searching for cases required for a query.
- Stock items such as stationery and prep room consumables often ran out because there was an inconsistent approach to ordering.
- Equipment for preparation, processing and movement of stock was kept in variable locations which wasted staff time.

How the changes were implemented

- The team began to use 5S and introduced shadow marking and stock level indicators to ensure standard work.
- Each staff member was given a tray with a laminated card with a big red A on it. This is the only place authorised cases are to be placed making them easy to locate when needed for a query.
- Shadow marking in the prep store room ensures equipment is returned to its standard storage area and stock levels can be controlled.



Measurable outcomes and impact

- Waste of motion removed – between one and two hours per week.
- Improved staff morale.

Ideas tested which were unsuccessful

The team initially tried sending emails on a distribution list asking all staff to look on their desks for required slides. This failed either because staff didn't check their emails or their screening time was interrupted and wasted whilst they searched their desk.

How this improvement benefits women

More time is available for reporting samples.

How this improvement benefits the organisation

Simple and quick solutions can be very effective.

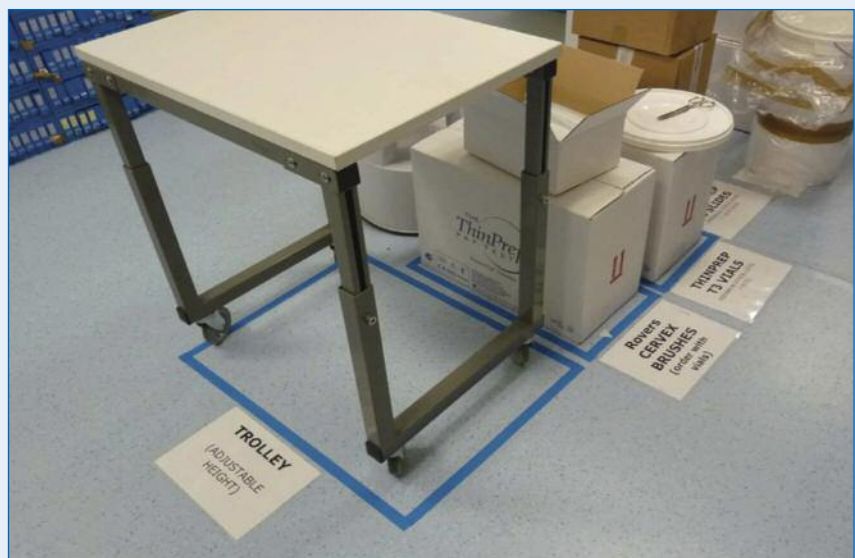
The team also recognises that 5S has to be an ongoing process to sustain the efficiency gains they have achieved.

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18. Standard work

What is standard work?

Standard work refers to the most efficient work combination that can be put together. A work combination is the mix of people, processes, materials and systems/machines that come together to enable completion of a work process.

Outside manufacturing it is common to hear comments like "... we're not robots, we don't make cars", but standard work happens in all walks of life:

- A speaker uses standard work, called an outline.
- A chef uses standard work, called a recipe.
- A football manager used standard work, called a game plan.

It's worth noting that standard work does not mean work standards. You will already have work standards e.g. standard operating procedures, but they do not ensure standard work.

It is once you have mastered standard work that variation in what and when work is done can be minimised. Variation and wasteful activities are restricted by standard work to avoid compromising the final outcome whether it be a delivered speech, restaurant meal for two, winning a football game or issuing the woman's test result within 14-days.

Standard 'work-in-process' inventory is the minimum amount of work-in-progress (WIP) (forms/processed/screened samples) that must be held at or between your work processes for smooth completion of a work sequence (i.e. test result). If this quantity of completed work does not happen at each step, it is impossible to synchronise work operations.

Making standard work flexible – using a pull system

Standard work allows the practice of just-in-time processing. This means maintaining little or no WIP by using a 'pull' system.

In a pull system, each department supplies the downstream department/process with the right forms/samples, at the right time, in the right quantity. In essence, the recall agency makes a request for ('pulls' authorised reports from) the electronic download, which 'pulls' from the volume of authorised, reported samples in the screening room. The screening room 'pulls' processed and dried samples from the prep lab. The prep lab 'pulls' registered forms from the office and so on up stream.

These planned re-order (kanban) points should be set to fit with daily capacity. Small buffers of work should be used to balance workload requirements of the next department where volumes of forms/samples 'requested' cannot be met.

Visibility and communication of what is expected and when should be available alongside what is actually received is key to this 'processing' system.

As requests are met, the supplied forms/samples are used in a first-in, first-out flow. This method of levelling work flow takes out variation in productivity and improves the predictability of achieving the overall seven and 14 day TAT targets. Its effectiveness can be monitored through statistical process control charting. It also gives screening teams a consistent plan and delivers on-time, uniform sample volumes from upstream prep lab and office processes. If however you operate with high errors/machine downtime it will be challenging to master a level schedule.

Case study 27

Standard work in screening

Barts and The London NHS Trust

Summary

The introduction of standard work in the screening room ensures a safer work environment and reduced turnaround time. Alternating screening of primaries and rapids has resulted in 30% of results sent and posted on the same day.

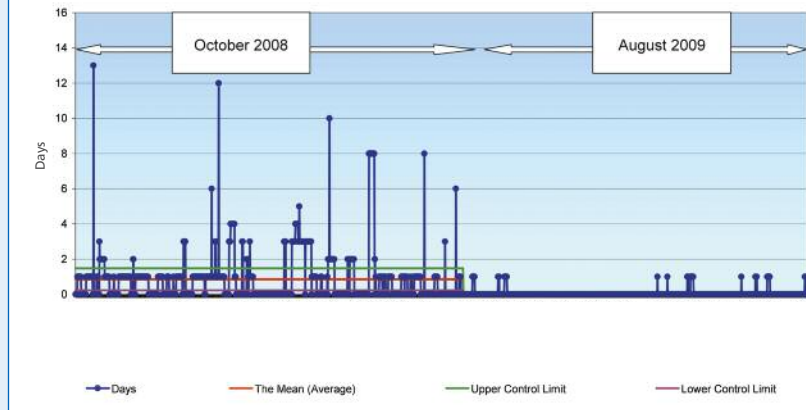
Understanding the problem

- There was no standard work in the screening room.
- Reviewing, checking and filing was not completed in a timely manner – there was no standard way / time when these were to be completed.
- Some slides missed the review/rapid screening. After primary screening, these slides were added to the filing pile. Once the slide was known to have not been reviewed, it was very time consuming to find it.

How the changes were implemented

- Standard work was established. Every screener alternated between one tray of primary then one tray of rapid screening.
- Once the tray of 10 had been rapid screened, the negative slides were filed immediately by the same person who had completed the rapid screen.
- The team had a separate filing room, but a drawer from the main filing unit was placed in the screening room.
- Batch sizes were reduced from 20 to 10.
- It was agreed that slides should no longer be left on screeners' desks overnight.

Delay from primary screening to review October 2008 and August 2009



Measurable outcomes and impact

- Reduction in turnaround time.
- 100% of slides are reviewed same day or following day after primary screening.
- The standard pathway for every slide and request form through the screening room provides a safer system. If a slide isn't in a designated place, it is clearly evident that there is a problem.
- Staff now have ownership of the process.
- 100% of negative slides are filed immediately.
- By introducing a standard way of alternating the screening trays of primary and rapids, 30% of results can be sent to the recall agency.

Ideas tested which were successful

- The team used the 5S tool to clear the work space and mark out each area. There is now a clearly defined area for primary, rapids, consultants, slide filing and request for filing.
- Alternating small batches of primary and review screening is working effectively.
- Filing is now completed immediately and it is now very easy to find any slide.

Ideas tested which were unsuccessful

This initiative was a success but it did take a number of attempts to get all staff onboard and working to this new standardised way. The project was successful due to good communication and persistence.

How this improvement benefits women

- Women now receive their result earlier.
- The system is safer.
- This standard system ensures a first in first out system. No slide is waiting longer than one day for primary and review screening to be completed.

How will this be sustained / potential for the future / additional learning?

Standard work has been sustained and will continue. Continuous improvement will maintain and improve the system.

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19. Takt time

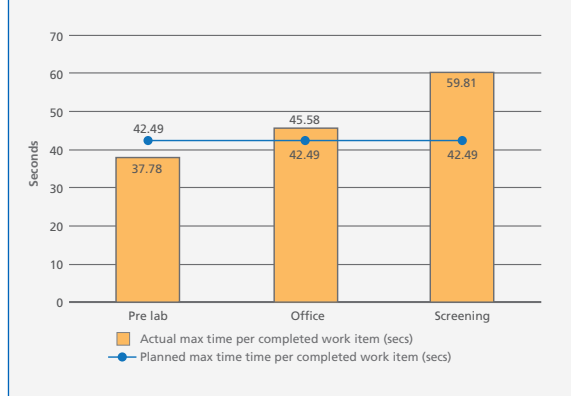
Takt time is the rate at which units of work (e.g. cytology test result letter) must be produced to meet customer demand (e.g. woman receiving her test result 14 days from when her sample was taken).

It is calculated as the total available work time per day/shift (e.g. total number of minutes within the shift minus breaks/lunches) divided by required daily output quantity (e.g. number of test result letters to be issued).

Cycle time is the time taken to finish tasks required for a work process and is typically measured from the point of completing the previous task to completion of the next task. To get an accurate reading of cycle time, it is recommended that at least two team members record the time taken to perform each department task 20 times. This can be done using a time observation sheet.

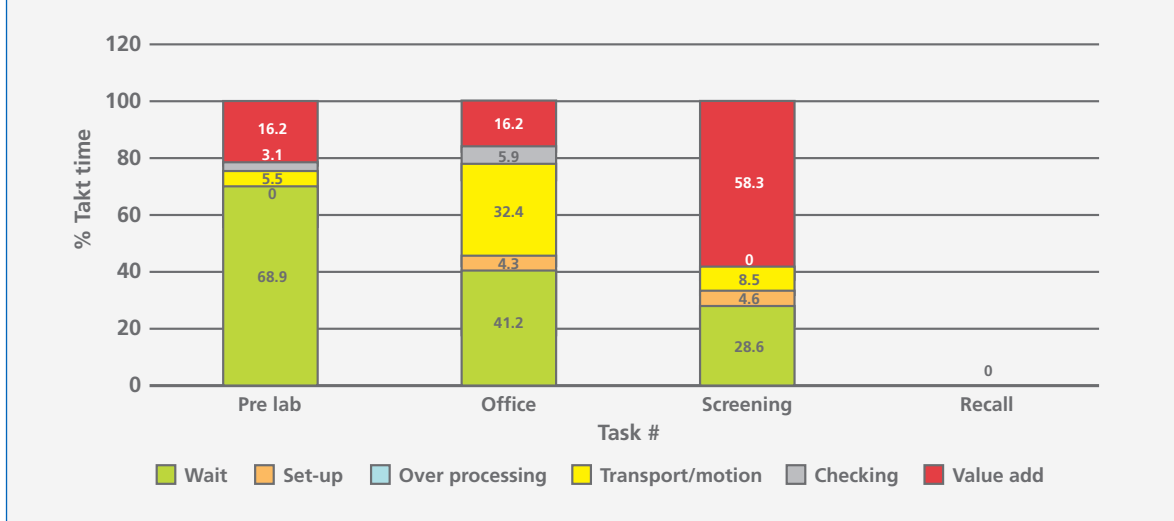
It is not uncommon to find department cycle times are higher than the takt time, meaning that staff members could not complete all work in a normal shift on the same day it was received or process higher volumes of work than received to reduce any backlog. Where this happens, potentially avoidable department agency and overtime costs are incurred.

Capacity vs. demand based on current daily work volume - Takt time



Work sequence is the order of tasks performed to make the work process within takt time. A number of forms are typically used here e.g. process sequence charts (see website for example) and standard work combination sheets as they are helpful for collecting information about the sequence of tasks, who completes them and the time/distance needed to complete each task. Stack charts may also be used to clearly quantify value-add and non-value add, or wasteful, tasks.

Stack chart showing waste analysis



20. Capacity and demand

Definitions and measurement

To provide an effective service it is important first to understand the capacity required to meet the demand placed upon it. To do this, the measurement of capacity and demand must be collected in the same units, the unit of time.

Demand

- Number of sample/slides
x time taken to process them.

Capacity

- Number of pieces of kit
x staff time available to run /screen.

Activity

- Number of samples/slides processed
x time taken.

Backlog/queue

- Number of samples/slides in the queue (waiting)
x time to process.

When the demand (requests) and the total capacity (kit and staff) are converted to time, excel tables and analytical charts can be used to demonstrate the gaps between the two.

Understanding variation

Monitoring demand over time will demonstrate natural and predictable variations, i.e. seasonal and bank holidays. Specific actions can cause additional variation, including transportation, batch processing of samples, screening information, transcription and IT downloads, all of which are under our control and can be changed. Daily transportation, eliminating batching, and multiple daily downloads will eliminate this variation. Staff can work more effectively when variation is eliminated.

What do you need to do?

- Understand the demand on your service; measure it and look for patterns in variation.
- Plan the capacity required based on 80% of the variance in demand, this will prevent a queue or backlog from building up.
- Ensure the correct skills/people are available to deal with the peaks and troughs in demand.
- Reduce unnecessary demand by examining referral thresholds.
- Increase capacity by removing waste by process redesign: usually only 5% of activities add value in a system.
- Reduce variation by:
 - Eliminating batching, adopting a first in - first out (FIFO) system
 - Pooling reporting amongst clinicians.
 - Levelling the work schedule to ensure staff utilisation is optimal by synchronisation of the processes.
 - Pulling work through the process.
- Deal with the backlog:
 - measure and monitor backlog
 - use temporary short term increase in capacity (overtime etc)
If a backlog exists and is constant, it is unlikely there is a problem with capacity.
- Monitor capacity and demand weekly using SPC charts.
- Use visual management techniques such as a clinical dashboard to:
 - Display the key measures to monitor daily and weekly demand versus the number processed (activity).
 - Display statistical process control (SPC) charts of the end-to-end pathway including key points along the pathway for consecutive patients.
 - Display the total number of samples/slides waiting at the end of each week.

And some important don'ts

- Carve out for specialisation and 'urgent' cases, it will cause a backlog.
- Use activity as a proxy for demand.
- Use averages.
- Go for 100% utilisation of your skill/assets.

Business cases for additional capacity will be more robust if clear evidence of capacity and demand can be provided.

Further information on capacity and demand, including simulation models showing:

- How a backlog or waiting list will build up if demand and capacity are mismatched.
- The impact of prioritizing urgent cases (carve out).
- The impact of 100% utilisation and how the flaw of using averages to set capacity will result in a backlog (queue).

These have been developed by Mr Richard Steyn, Consultant Cardiothoracic Surgeon and are available at: www.steyn.org.uk.

Alternatively, visit the NHS Improvement website to access the Improvement System capacity and demand analysis tools.

The following case studies demonstrate how capacity and demand analysis has been used to redesign the service.

Case study 28

Using capacity and demand Information

Central Manchester and Manchester University Hospitals NHS Trust

Summary

The laboratory team are now able to accurately plan their workload and staffing using demand and capacity data. They now forecast the number of slides that need to be screened to reduce the backlog, staff can be allocated effectively and work planned appropriately. This resulted in reduction of the backlog from **21,390** to **11,700** in 91 calendar days approximately eight months earlier than predicted.

Understanding the problem

- The team couldn't predict or plan what the workload would be or how to reduce the backlog.
- There were high levels of stress amongst the team.
- The backlog was increasing despite overtime and locum staff appointments.

How the changes were implemented

- They started by collecting data, measuring volumes received into the department, volumes being screened and the available hours for screening.
- Process sequence charts were prepared showing the whole process with the appropriate timings required for each step.
- Inventory (backlog) that was waiting in the department was logged – this was a one off count which could then be updated daily by recording incoming work and screening completed using an Excel spreadsheet.
- Knowing what was being received and the daily screening capacity meant they could then plan the reduction of the backlog.
- The numbers of samples screened is entered on the daily huddle board for all to see and the expected date for clearing the backlog.

Measured outcomes and impact

- The number of samples that needed to be screened in order to bring down the backlog could be predicted.
- The backlog was reduced from 21,390 to 11,700 in 91 calendar days.
- The team progressed ahead of plan and the date of expected backlog clearance has moved forward from May 2010 to the end of September 2009.

Ideas tested which were successful

- A specific area was identified in the screening room within which to lay out each days work.
- Slides for screening each day are put out and clearly labelled with the date of receipt and marked as whether it is rapid or full screening along with the different specimen types.
- A white board was placed in the screening room and the number of slides screened and authorised is updated daily along with the expected date to clear the backlog. This visual management approach has helped with morale as it feels good to see the progress being made.

Ideas tested which were unsuccessful

The team tried putting out a volume of slides to match each days' capacity but as they have two different sample types and not all screeners can deal with both they found it difficult to achieve the right number of samples and still keep working in date order.

How this improvement benefits women

This will have an impact on 92,300 women annually.

How this improvement benefits the organisation

The team is continuing to monitor daily output and ensure that the changes implemented are maintained.

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Case study 29

100 day plan

The Leeds Teaching Hospitals NHS Trust

Summary

The average turnaround time from date of sample taken to receipt of result has been reduced to 14 days as planned.

In addition, 77.5 hours of screener time (capacity) has been released weekly and a £30k saving by avoidance of annual overtime costs.

Understanding the problem

After initial training from the NHS Improvement team, the core team walked the whole pathway from the time the sample was received in the laboratory specimen reception to the time the result letters were posted from call/recall.

Waste ID sheets were filled in by all members of the team.

Process sequence charts were completed detailing all aspects of the pathway stating distance travelled, time taken for each process, checking time and waiting time.

How the changes were implemented

- A future state plan was agreed detailing the changes needed in the next six months to achieve the 14 day target.
- Initial changes were identified from the waste ID sheets as quick wins that could be implemented by the end of November.
- Initial progress was good. Due to a 29% increase in demand from February to June 2009 as a result of media coverage of cervical cancer, progress then slowed considerably.
- A jumpstart event was held in April 2009 to formulate a plan to help the team reduce the turnaround times in each area with a view to getting back on track to achieve the 14 day target.

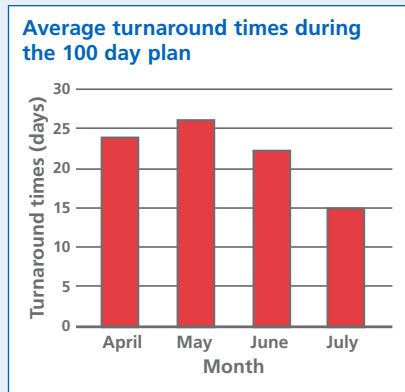
- A demand and capacity model was built which showed that without increased capacity in the office and screening room, or a large reduction in demand, the team would be unable to reach their goal. The team used this information to decide on the capacity needed to reduce the backlog to 14 days to result authorization by the end of July 2009.
- The laboratory pathway was walked by the core team and extra members drawn from the preparation laboratory, office and screening room and new waste ID charts were completed.
- Problems in each area were identified and put into a fish bone diagram.
- Problems with a low/medium effort to resolve with a high impact on results were identified and prioritized for action.
- A '5 whys' analysis was performed on the key action points to determine the changes that should be made.
- A PDSA (Plan, Do, Study, Act) plan was drawn up for all changes to be implemented, and expected benefits were noted.
- A control plan was produced to ensure that proposed changes were implemented.
- Using the process sequence charts, the waste was quantified.
- A 100-day plan was implemented in order to achieve a turnaround of 14 days from date sample taken to report authorization by reducing waste, improving the flow of work through the department, and maximizing capacity.

Some of the key changes implemented were

- Batch sizes were reduced to improve flow and reduce wait times.
- Office – batch sizes reduced from 24 to 12.
- Screening room – batch sizes reduced from 16 to eight.
- Daily targets were introduced in each of the areas within the laboratory.
- Lab – process 12 runs per day (576).
- Office – register 48 batches of 12 forms per day (576 forms).
- Screening room – screen six slides per hour/screener (including pre-screen and result sign-out).
- Date stamping on arrival for each sample was eliminated, and replaced with date/time received written on first form of each batch.
- A seniors rota was introduced in the screening room to allow senior staff more time to primary screen slides.

Measurable outcomes and impact

- Since the implementation of the 100-day plan to the end of July the average turnaround time from date of sample taken to result authorisation has been reduced from 24 days to 14 days.
- **77.5 hours** – screener time (capacity) released weekly.
- **£30k** - now avoiding annual overtime costs.



How this improvement benefits patients

- An improvement in turnaround times from 24 days to 14 days within the laboratory resulted in women receiving their results 12 days earlier than in April 2009.

How will this be sustained/potential for the future/additional learning?

- The turnaround times continue to fall with an end-to-end turnaround time of 14 days for 98% of women in September 2009.
- Standard operating procedures have been updated to reflect the changes implemented.
- Demand and capacity tools updated daily.
- By 31 March 2010, the next state pathway planned to achieve 95% of results received by day seven, 40% received by day four.
- Ownership already transferring to day-to-day management away from core team through daily problem solving and agreed control plans.
- Control plans have allocated roles/responsibilities for:
 - Lean service improvement training
 - Regular go and see waste walks.
 - PDSA problem solving.
 - Routine dept use of demand/capacity and takt time tools.
 - Upkeep of performance measures and control charting.
 - Department head led best practice reviews.
 - Section head to audit team leaders' workplace assessment/5S schedule and ensure any failures are acted upon.

Waste			
	Baseline	Current	% Change
• Transportation (m)	117392	44275	- 62.3
• Wait time (%)	96	67	- 29
• Motion (%)	0.8	4.9	+4.1
• Inspection (%)	0.1	4.1	+4.0
• Value Add Ratio (%)	4.1	23.6	+19.5
Performance			
	Baseline	Current	% Change
• Avg TAT (days)	24.32	0.5	-69,2
• % in 14/7 (days)	3/0.13	98/58	+98/58
• Work outstanding	2407	716	-70
• No of reports authorised (pd)	6.1	6.7	+8.9

Ideas tested which were unsuccessful

- The team work in an off-site building nine miles from the base hospital. The computer network link is too small resulting in constant delays in logging on to the system and during data entry.
- Log sheets were completed for all delays and sent to the head of department. However, an application to upgrade the computer network link was rejected by the trust on financial grounds as the team will be relocated back to the main hospital site within the next two to three years.
- The problem has been partially resolved by the use of thin clients which reduce log on time by 60%.

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Case study 30

Cost avoidance

Hull and East Yorkshire Hospitals NHS Trust, Hull Royal Infirmary

Summary

A **cost avoidance of £72,000** has been achieved as a result of more appropriate and timely management of workflow using the 'lean' methodology introduced into the department as a pilot site. This money represents the expected spend on outsourcing.

A drop in demand for tests brought about by the introduction of LBC technology, changes to screening intervals and recall have also contributed to the ability to bring work back 'in-house'.

Understanding the problem

Over a consistently long period of time the laboratory had insufficient capacity to cope with demand due to long term sickness and an agreed leave of absence amongst screening staff. It became necessary to outsource approximately 33% of the workload of the laboratory over a prolonged period of time from July 2007 until December 2008.

- The annual budget for cellular pathology could not accommodate the expense of out-sourcing 33% of workload for screening, and as no other form of finance was available this was recorded as an overspend on the departmental accounts.
- The amount of samples sent for external screening on a weekly basis were logged and carefully monitored for audit purposes. Costs incurred were recorded via invoicing between departments at £6 per test including quality control of negatives.
- Unnecessary waiting - delays identified as a minimum of 11 days because of the logistics involved in sending the samples away for screening and receiving them back for authorisation and processing by patient data services.

- Inventory - the logistics meant that there was a necessary time lag before reports could be issued by the laboratory in Hull. A number of abnormal samples were identified in the outsourced work but checking and reporting by a pathologist was only carried out once the samples had been returned. This resulted in a further delay in abnormal reporting.
- Defects - discrepancies in screening protocols meant that thresholds for unsatisfactory samples differed, resulting in more, and unnecessary, work for the team.

How the changes were implemented

Highlighting the reasons for the added expense incurred by the department in outsourcing the work, and the delays in reporting incurred, enabled the department to address the issues which were raised.

- Changes to standard working practice were implemented after consultation and agreement from all staff.
- A visual management system was put in place to monitor the output of work from the department on a daily basis so that remedial action

could be instigated if a build up in backlog of work became apparent.

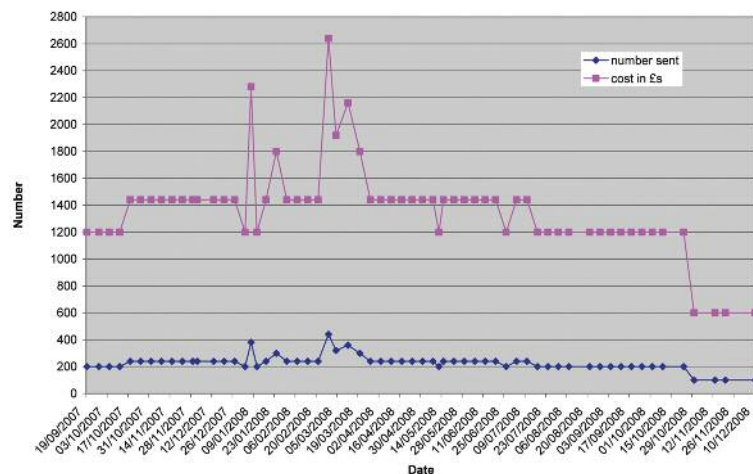
- Interruptions in the screening room were monitored and where necessary changes implemented to avoid them
- In October 2008, two members of the screening team returned to work after a long period of absence.

Measurable outcomes and impact

The graph below illustrates the volume of work which was out-sourced each week over a prolonged period of time, and the related costs to the department for using this service.

- The **cost of £72,000** for sending work out for screening was saved as the changes within the department enabled the work to be performed without the provision of extra resources.
- There was a dramatic reduction in end to end TAT as a delay of 11 days was instantly removed.
- Quality was ensured as unnecessary steps were removed from the process.
- Staff morale improved because of the improved capacity to manage our own workload.

Number/costs of slides outsourced per week



Ideas tested which were successful

- Adoption of Lean working methodology in the department which came as a result of inclusion in the pilot project raised awareness of all members of the team to working differently.
- The five minute staff meeting held at the start of each day was used as an opportunity for all staff members to make suggestions that they felt would improve workflow through the department. Many of the changes that were implemented came as a result of this process.
- Minor changes to working patterns in the screening room impacted significantly on work flow.
 - A designated time in the mornings was set aside for rapid review of negative and unsatisfactory samples, so that they could be authorised and sent out promptly.
 - A new standard working practice to screen a rack of eight slides, and then rapid review and authorise a rack of eight slides throughout the day was introduced.
 - A cordless phone enabled staff members, when necessary, to look up and answer telephone queries from service users, without having to leave their work station, thus minimising disruption.
- Closer collaboration between pathologists, and a flexible approach to work distribution based on excess capacity has enabled the department to manage abnormal reporting backlogs, keeping delays to a minimum.
- A department wide workforce assessment aimed at addressing some of the issues surrounding capacity enabled a long term workforce planning package to be put in place for the future.

How this improvement benefits patients

Work was completed in-house in a timely fashion and the delays caused by out-sourcing are avoided, which improves service delivery for the women concerned. Avoiding the enhanced rate of out-sourcing means the trust can use the savings more appropriately.

How will this be sustained/potential for the future/additional learning?

There is now a system in place where staff can make suggestions for improvements to service provision, knowing that they will be assessed using PDSA methodology and implemented where appropriate. Money was saved because the out sourced work had been paid at a significantly enhanced rate compared to the cost of doing the work in-house.

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21. Communication

The importance of good two way communication

Answering a telephone call, attending a meeting, receiving an email, having a face-to-face conversation with a colleague, reading a newsletter or watching a news article; these are all communication activities that we frequently experience.

Establishing the framework for, and maintaining, good two way communication is critical to the success and sustainability of any improvement activity.

- 'Go and see' the process you are trying to improve. Speak to patients, users and people involved with the process, see and hear what is happening and ask questions to deepen your understanding.
- Communicate with and involve key people as early as possible during the planning stage of any improvement activity.
- Share information regularly. Use monthly project meetings and daily five-minute meetings to confirm progress, to allow ideas to be raised and questions answered. Always allow sufficient time for feedback on actions.
- Communicate visually - 'A picture is worth a thousand words'.
 - Use A3s to support problem solving, to set out improvement proposals and to confirm the status of an improvement project.
 - Create a communication board to support two way communication, to review progress and to support problem solving.
- Listen to the opinions of colleagues, including those that differ with your own. Seek to create an environment where discussion can take place in an open and fair way.

It is everyone's responsibility to ensure good two way communication takes place. With a well informed, well engaged team, your improvement activity will have the solid foundation it needs to make it a success.

Case study 31

Understanding communication issues

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

Communication is the key element to achieving successful change.

Although everyone was invited to highlight problems and offer suggestions to improve the process, staff still felt they were not listened to and that any suggestions they made were ignored. It was recognised that the team went through the well documented grief loss cycle and found themselves at the bottom of the cycle in despair.

A display area in the main thoroughfare was designated for suggestions, discussion, feedback and outcomes. Staff became enthusiastic and willing to offer suggestions.

Understanding the problem

During the early stages of the improvement process, most staff were willing to take on changes albeit with a degree of scepticism. As the improvements developed, and activity increased staff started to feel overwhelmed with constant change.

They started to feel that change was being imposed, they didn't have ownership and many of their suggestions were ignored. As a result of this:

- Motivation began to fall.
- Staff became antagonistic to the senior team.
- Changes were misunderstood.
- Ideas and suggestions stopped
- Any changes communicated received negative comments like 'that won't work'.
- Communication that was in place began to break down.
- The senior team felt they were praising and listening but staff did not recognise it.
- The senior team became despondent.

How the changes were implemented

The team asked their national improvement lead for help and took the following steps:

- A recap on the principles of Lean was given by the Improvement lead with the recognised 'grief loss' model included.
- Staff were given the opportunity to openly vent their feelings without the senior team present.
- A feedback session was conducted with the management team
- A suggestions wall was set up with three sections - staff post their ideas and suggestions, receive feedback on those ideas from all colleagues and can then track progress of all ideas and outcomes.

Feedback is also given at the daily team brief and open discussion of ideas encouraged.

Measureable outcomes and impact

- The staff engagement surveys were embraced by all with 100% of staff completing and returning them.
- Survey scores showed a 4% drop over the period that the team were recognising the need to address communication.
- By April 2009, 22% of the team felt their personal morale had improved since the start of the project.

Ideas tested which were successful

- The introduction of the suggestion wall gave everyone the opportunity to see the ideas suggested, the progress being made and the outcomes.
- Data was collected before and after any changes to prove the change worked.
- Daily team briefings allow open discussion of suggestions giving everyone ownership.
- Notes from the daily brief are posted on the suggestions wall for a rolling week.

Ideas tested which were unsuccessful

- Talking about the changes at team briefings did not give staff the feeling of ownership or the feeling of empowerment – visuals were also needed.
- A 'suggestions implemented' board was posted in the staff rest room but tended to be overlooked by staff and some felt this imposed on their personal time.
- Although thanks and praise were given at the team brief we realised a visual reminder of success was also needed.

How this improvement benefits women

The better morale has improved team working resulting in an enhanced workflow and shorter turnaround time for womens' results.

How this improvement benefits the organisation

We all need constant and relevant communication. We need to know what affects us and what is expected of us. The actions taken have improved the working environment and will help the team to sustain Lean as the way of working long term – not just a one off project.

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22. Leadership, engagement and sustainability

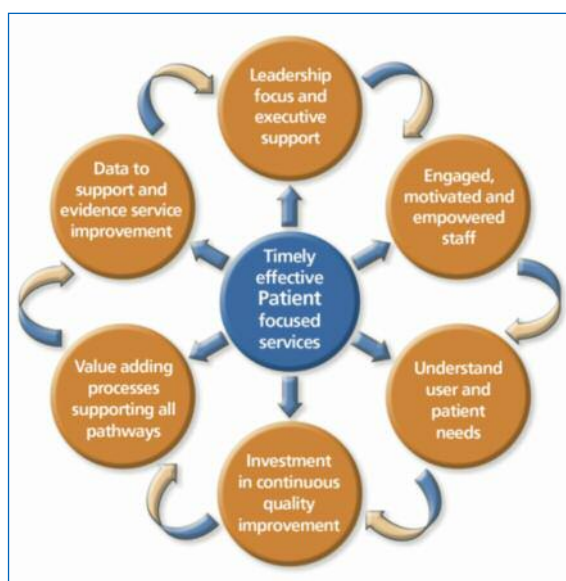
What is the definition of sustainability, and how do we achieve it?

“Holding the gains, evolving as required, and definitely not going back to the old way....”

Jean Penny - Human Dimensions of Change

The presence of certain factors is crucial, not only to ensure sustainability, but also to foster a culture of continuous improvement.

The following were identified by the Pathology Service Improvement Team in 2006 in the document *'Learning from Pathology Service Improvement Pilot Sites and Improvement Examples'*.



- Leadership focus and executive support.
- Engaged, motivated and empowered staff.
- Understand user and patient needs.
- Investment in continuous quality improvement.
- Value adding processes supporting all pathways.
- Data to support and evidence service improvement.

These elements are similar and consistent with redesign in other clinical services and are not unique to pathology. The work undertaken by the 'Cancer Services Collaborative Improvement Partnership' around sustainability of service improvement supports these findings and builds on the existing body of knowledge about sustainability.

A sustainability model and toolkit (NHS Institute for Innovation and Improvement - 2003) has been developed for clinical teams covering similar areas to those identified above.

Leadership and engagement

A staff survey was introduced during phase one as a tool to measure the impact of changes on staff. It was communicated as a morale survey and teams asked their staff to complete it on a quarterly basis.

Teams were not given any guidance on how to use the survey or the results beyond obtaining a percentage score and, not surprisingly, there was little evidence of any action being taken to address the results. Some sites did not share the results with their team. Staff quickly became disengaged with the survey itself.

The key learning point is that this survey should not be used purely as a measure but as a tool to facilitate change through understanding and working to improve staff engagement and developing leadership capability.

Leadership is a behaviour - “What we do as leaders is more important than what we say.”

Sir Nigel Crisp

What is engagement?

The aim of the engagement survey (referred to as the morale survey) is to encourage and support a culture of open and honest feedback which will motivate leaders at all levels of the organisation to act on results and improve their leadership capability.

Efforts to change processes and systems alone will drive improvements but sustainability could be at risk. Developed leadership capability and improvements in staff engagement will maximise gains, enable sustainability and spread and facilitate the cultural shift to becoming a continuous improvement organisation.

The survey has been developed to reflect the work of the Gallup organisation and more can be learned from *'First, break all the rules'* by Marcus Buckingham and Curt Coffman (see section 26, websites and useful reading).

There are 12 questions covering:

- How staff feel they are treated.
- The extent to which they feel able to perform their role effectively.
- The level of engagement which exists between the person completing the survey and their leader(s). It is not only about the direct relationship a staff member has with their first line supervisor.

The level of performance a manager can expect to get from their team will be dependent on a number of factors which can be directly influenced by that manager. The survey addresses these factors and will provide managers with a range of information about their team that they can explore and should act upon.

More detailed preparation support is provided on the NHS Improvement website.

Why bother?

Recent research (Gallup) reveals that a 10% increase in engagement will produce a 6% rise in effort and a 2% rise in performance. When people feel genuinely able to 'strongly agree' with the questions in the survey they are feeling in a good place and want to stretch to be their best.

Where staff are saying they 'strongly agree', consider whether they are backing up these answers with comments that explain them. Where there are no comments it is possible the team are ticking the boxes that will either 'protect' a well liked (but not necessarily effective) manager or are looking for a 'quiet life'. Only the manager of the team will know the real situation.

Spread

The study of the spread of ideas suggests that it is relatively rare for ideas to spread instantly. The process of adoption and adaptation of ideas often occurs through conversation and interaction amongst peers.

Changes may go through a process of re-invention to fit with organisational systems and procedures as they are adopted.

Ideas that spread more rapidly, often:

- Have qualities that show a clear advantage over the current way of doing things.
- Are compatible with current systems and values.
- Are straightforward changes with simple implementation.
- Have an ease of testing before full implementation.
- Have easily observable impacts.

The purpose of this document is to publish the learning from phase one pilot sites for other teams to adopt.

It recommends sites to visit to discuss improvements made and the benefits and possible pitfalls of adopting the changes.

Challenges to sustainability – coping with surge

Phase one sites began to evidence improvements in their turnaround times as a result of changes introduced within a few months of beginning their programmes.

High profile media attention on cervical cancer following the death of Jade Goody resulted in an unprecedented increase in demand across the cytology service. This increase threatened the success of the work being undertaken as some sites questioned the benefit of the time out required to continue working with Lean tools.

'Jumpstart' events were held to refocus teams on their end goal and to identify further steps that could be taken to either maintain focus or get back on track.

Employing the Lean principle of 'pull' is of particular importance in times of surge. Retaining samples at the point of receipt and pulling them through in accordance with screening capacity maximises output.

Standard work and visual management should be used rather than re-introducing priority work streams. Exception cases can be identified and processed immediately (and not batched) before proceeding through the lab on a first in, first out basis. It is important to identify the point at which it is no longer necessary to pull these cases out to ensure the 14 day TAT is met.

The following case studies identify how laboratories coped with this demand increase. Further case studies can be found on the NHS Improvement website.

Case study 32

Sustainability - managing a surge in demand

Taunton and Somerset Hospitals NHS Trust

Summary

It is possible to achieve the 14 day turnaround time in the face of increased demand.

Consistent and unwavering management and executive support encouraged the team to maintain the new ways of working.

Understanding the problem

- 130% increase in demand.
- Time from receipt to data entry increasing and backlog building up.
- Rollout of electronic test requesting (order comms) stalled at implementation stage.
- Needed a secure server for scanned request form images.
- PC upgrades required for all staff, especially screeners.
- Printer requirements (purchased but not installed).
- HR support required for enhanced and redefined data entry/MLA roles.
- Needed to establish electronic data download to one of the result agencies.

How the changes were implemented

- Samples stockpiled at point of receipt. Unpacked and processed in sufficient daily quantities to pull work, first in first out (FIFO), through the screening room.
- Cases identified as urgent (colposcopy, or returns having been sent back due to error detection previously) were prioritised and processed the same day, then dealt with on a first in, first out basis along with the days routine cases.
- Sample takers were kept informed at all times of the turnaround time and backlog via the pathology intranet site.
- CEO and executive sponsor receive copies of monthly local and national reports which are also brought to attention of full executive.

- Executive sponsor walks the process every month to discuss value stream and address roadblocks or issues.
- CEO visited the department, spent time with staff and worked through road blocks with significant success.

Measurable outcomes and impact

- Capacity and demand data confirmed it would have taken at least three weeks longer to eliminate the backlog had the team transferred staff from screening to reception/prep work.
- Managing the surge in a systematic fashion allowed the team to proceed with Lean driven changes to laboratory processes. During the period of the backlog TAT reduced by a further 1.5 - 3 days within the screening room (dependent on whether the slide was negative on primary screening).
- After initial discomfort with the visual impact of the backlog, staff morale improved despite the pressure.
- Consistent executive support (including a huge cake from their Chief Executive, Jo Cubbon) was critical to the process and has been greatly appreciated by all staff.
- The electronic test requesting process developed fresh momentum with over 60% of Somerset GP practices operational by the end of the project.
- The trust PC refresh programme delivered five new PCs immediately after raising the issue with the CEO, and a further eight PCs five months later.
- A trial of old versus new PCs demonstrated a saving in time of 30% for a full primary screen including history check.
- HR rapidly processed a re-banding exercise for MLA staff.

How will this improvement benefit patients

- Delivery of 14 day predictable turnaround times, a year ahead of schedule.
- Elimination of backlog sooner than anticipated, reducing clinical risk of adverse outcome.
- Improved safety for patients with the introduction of order comms.
- Improved communication with sample takers in primary care prompted by this and other improvement initiatives.
- Highlight the importance of the screening programme to senior trust executives.

How will this be sustained/potential for the future/additional learning?

Successes achieved evidence the strength of the improvement process:

- The team feel they have achieved a change in culture over the last nine months.
- Produced benefits far beyond those within the screening service as the improvement philosophy is rolled out to a broader audience in the trust.

To sustain the cultural changes will require effort invested in:

- Developing and maintaining standard work for managers.
- Ensuring senior executive support shown within the hospital is also reflected in the other NHS organisations involved in this multi-agency service.
- Collaborating with non clinical services, including HR and IT.
- Sharing learning and expertise with the new hospital service improvement team.

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Case study 33

Sticking to Lean principles

Ashford and St Peter's Hospitals NHS Trust

Summary

In the face of an increase in demand of 80-100%, the team maintained their commitment to changes made and continued to adhere to Lean principles.

They are now adamant they don't want to return to the old ways of working and will carry on pursuing continuous improvement via PDSA cycles.

Understanding the problem

- 80 -100% increase in demand as a result of media attention.
- Recognised that to achieve success the whole department should be on-board with the Lean principles.
- A need to focus on eliminating waste so staff could concentrate on the value added steps in the processes.
- When sharing their plan to achieve 14 days TAT the core team found that most people thought it would be a waste of time and would create extra work.

How the changes were implemented

The team decided to implement small changes in the beginning:

- Reducing batch sizes from 20 to 10 made a significant difference to TAT and improved work flow, with very little effort from the prep room, office and screening staff.
- Process sequence charts were used to identify checks that did not make a positive contribution to quality. After consulting with the QA department and the cytology team, unnecessary checks were removed.
- Over labelling of slides with patient names was removed.
- 5S was used to improve the working environment in the prep room, with visual management photos used to ensure changes are sustained.

BUT the team recognised that not everyone was engaged:

- The core team visited another lab to see how they had used the Lean tools. They observed the visual

management used to show progress and engage the whole team in the continuous improvement.

- The team were not confident that this approach was important but the idea was put to the wider staff team and the majority thought it would be a good idea.
- White boards now show daily demand and activity and staff are more interested in what is influencing the results they can now see.
- Staff are now more interested in the project and contribute ideas of their own.
- Five minute meetings were introduced to ensure everyone keeps pace with the changes.

Measureable outcomes and impact

The team persevered with the changes and were back to achieving 90% turnaround time within 14 days by May 2009. The department were then able to screen work for other laboratories who were struggling with large backlogs.

Ideas tested which were successful

- Printing Open Exeter for women with abnormal or early recall history only - reducing the waste of paper and time.
- First in - first out in the prep room - removed separation of 'urgent', 'private' or colposcopy samples and added them to the routine batches.
- Using root cause analysis to find the real problems.

- Visual management providing daily figures raised and maintained staff awareness and engagement.
- Visual management in the form of yellow stickers with dates on for 'abnormal' results so consultants know how long they have to report the result to meet the turnaround times.
- Going to see the whole patient pathway and working collaboratively with the PCSS to agree the best time to send the result runs.

How this improvement benefits women

In July 2009, 100% of women received their result in 14 days with 60% receiving them in seven days, compared to 72.7% of women receiving their results in 14 days and 0% in seven days in October 2008.

How this improvement benefits the organisation

Being aware of the challenges surrounding change and being willing and able to embrace them will support the team desire for continuous improvement.

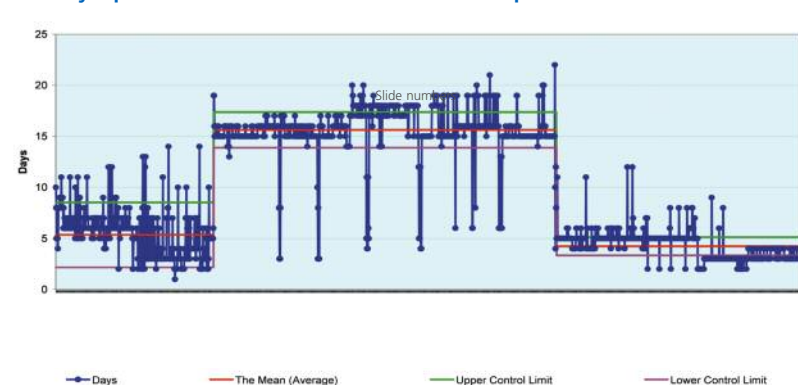
With good communication, listening to each other and continuing to apply the Lean principles, the changes made will be sustained and developed further.

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January/April/June 2009 lab turnaround data comparison



23. Customer experience

A fundamental principle of Lean is to identify 'value from the customers' perspective' and make value flow. In healthcare the customer is usually the patient. In cytology it is the woman.

Since the Cervical Screening Programme has a preventative agenda, customer/patient engagement has proved to be the greatest challenge since 'patients' are essentially 'well' women and a patient questionnaire has not been appropriate.

PCTs have adopted different approaches to customer engagement:

- Some are currently involved in a social marketing exercise to increase take up of invitations to attend for screening.
- Some have increased awareness amongst women of the new guaranteed and predictable turnaround times via newsletters and working with frontline sample taking staff.

As turnaround times (TATs) reduce dramatically to less than 14 days, women should be made aware at the time of the appointment of the improved TATs to manage their expectations. Recent experience has demonstrated the receipt of earlier than expected results can cause unnecessary worry and anxiety.

Engaging the PCT lead, GPs and sample takers will ensure improvements in the service are communicated effectively to the women.

Case study 34

Colposcopy service improvements

Cambridge University Hospitals NHS Foundation Trust, Addenbrookes Hospital

Summary

The colposcopy service has improved the service and experience it provides to the 1,395 women per year being referred, due to improved information provision by the laboratory. This enables the units to provide optimal management for each patient in a timely fashion, allowing effective triaging and counselling.

Changes to the process have saved 2.25 hours per week in the laboratory, (approx 13 days per year).

Understanding the problem

The process:

- The direct referral process to colposcopy (three units) was completed on a weekly basis with hard copy lists being sent.
- Colposcopy reported the abnormal result to the woman along with an appointment invite – patients were waiting up to two weeks after the result was reported by the lab to discover their abnormal result.
- Suffolk call/recall changed their process to send results letters daily in early 2008 and included writing to women with requests to contact colposcopy.
- The colposcopy unit received a call/recall report at the same time but it contained insufficient information to manage the patient appropriately when they telephoned to ask for an appointment.
- Staff were not receiving the cytology report until after patients had telephoned and faced difficulty with counselling women as they were not clear on the patients potential condition.

The issues:

- Inequality – women with a normal result were receiving their results ahead of those women needing a colposcopy referral.
- Safety – need to ensure women are seen for investigations appropriate to their grade of abnormality.
- Patient experience – providing a joined up service that recognizes the potential worry and distress experienced by a woman being advised of an abnormal result.

How the changes were implemented

- Interrogation of the system established that the lab could produce colposcopy lists on a daily basis.
- A secure email facility was arranged to send results direct to the colposcopy units.

Measurable outcomes and impact

- Reduced turnaround time – result letters for women referred to colposcopy are now sent out Monday to Thursday.
- Most women now receive their colposcopy invitation letter two days after the result is reported.
- Patient care has improved as colposcopy staff are able to triage the patient and give appropriate counselling and advice.
- **2.25 hours** per week of lab' staff time saved (**116.25 hours** per year).

Ideas tested which were unsuccessful

- The first step with the daily printed reports to colposcopy was to send them via the internal postal system. Reports were delayed and women telephoned the colposcopy units in response to their letters before the unit received their full result report.

- Lab staff made an assumption about how much information the call/recall service provided meaning that the information included in the colposcopy reports was initially not suitable for their needs.
- Daily reports were initially copied and pasted into an email – this format was not suitable for printing and use by colposcopy.
- The next step was to print the reports before scanning them and attaching them to an email. Colposcopy could work with this format but the process for creating it was not ideal, with the scanning machine being located on a different floor to the senior staff member who completed the task. The scanner was subsequently relocated and the task assigned to the administrative team
- Realising that this process was still not ideal, the reporting system was interrogated further and a way to import and export data into a suitable format was identified, removing the need to print and scan.

How this improvement benefits women

The 1,395 women who we refer to colposcopy each year receive their results quicker. They also experience better care when they contact colposcopy for an appointment and information about their result.

How this improvement benefits the organisation

The process continues to evolve with Cambridgeshire call/recall moving to replicate the Suffolk practice of issuing colposcopy invite/result letters.

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25. Websites and useful reading

Websites

NHS Improvement - Diagnostics

www.improvement.nhs.uk/diagnostics

Cytology Improvement

www.improvement.nhs.uk/cytology

- Cytology improvement guide – Achieving a 14 day turnaround time in cytology
- Case studies

Pathology Improvement

www.improvement.nhs.uk/pathology

- Case studies
- NHS Improvement Pathology Toolkit

Improvement Leaders' Guides

NHS Institute for Innovation and Improvement

Sustainability Tool

www.institute.nhs.uk

NHS Cervical Screening Programme

www.cancerscreening.org.uk/cervical

Useful reading

A3 Problem Solving for Healthcare

Cindy Jimmerson

ISBN 978-1-56327-358-2

Demonstrates how to use A3 to problem solve. Contains practical examples from USA healthcare that can be easily translated to UK.

Lean Healthcare – Improving the patient's experience

David Fillingham

ISBN: 978 -1- 904235-56-9

Written by CEO of Bolton NHS Trust as an account of his experience of the long term perspective of using Lean to support whole healthcare.

The Gold Mine

Freddy and Michael Ballé

ISBN: 978-0974322568

Comprehensively introduces all the lean tools by means of a vivid personal story showing how hearts and minds are won over.

The Toyota Way

Jeffrey Liker

ISBN: 978-0071392310

Explains Toyota's unique approach to Lean Management – the 14 principles that drive their quality and efficiency obsessed culture.

Creating a Lean Culture

David Mann

ISBN: 978-1-56327-322-3

Helps Lean leaders succeed in transformation. A critical guide to developing and using a lean management system.

The New Lean Toolbox

John Bicheno

ISBN: 0 954 -1-2441 3

A guide to Lean tools and concepts

Learning to See

Mike Rother & John Shook

ISBN: 0-9667843-0-8

An easy to read practical workbook for creating a value stream map to evidence waste in a process.

Managing to Learn

John Shook

ISBN: 978-1-934109-20-5

How A3 enables an organisation to identify, frame, act and review progress on problems, projects and proposals.

Making Hospitals Work

Marc Baker and Ian Taylor with Alan Mitchell

A Lean action workbook from the Lean Enterprise Academy

First break all the rules

Marcus Buckingham and Curt Coffman

What the worlds greatest managers do differently.

Value stream mapping for healthcare made easy

Cindy Jimmerson

ISBN: 978-1-4200-7852-7

Demonstrates why value stream maps are a fundamental component in applying Lean.



NHS Improvement

With ten years practical service improvement experience in cancer, diagnostics and heart, NHS Improvement aims to achieve sustainable effective pathways and systems, share improvement resources and learning, increase impact and ensure value for money to improve the efficiency and quality of NHS services.

Working with clinical networks and NHS organisations across England, NHS Improvement helps to transform, deliver and build sustainable improvements across the entire pathway of care in cancer, diagnostics, heart, lung and stroke services.

NHS Improvement

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