Dr Rachel Carling

Using A3 methodology to successfully sustain change: a simple and effective approach

A3 thinking is a problem-solving approach that is built around the PDSA (plan-do-study-act) cycle. The idea is that an A3 sheet of paper is used to record a clear summary of the problem. The A3 template starts with identifying the problem, recording the current state and determining the goal of the improvement process. This encourages a structured way of thinking to provide a long-term sustainable solution.

Ms Erin Mozley

Biochemical Sciences is one of the Viapath laboratories at Guys & St Thomas' NHS Foundation Trust. The laboratory provides a regional metabolic biochemistry service and is a key part of the Paediatric Metabolic Disease multidisciplinary team based at Evelina London Children's Hospital. One of the core tests is analysis of blood spot phenylalanine and tyrosine to enable monitoring of patients with Phenylketonuria (PKU). Patients with this disorder lack an enzyme required for the metabolism of phenylalanine. This results in accumulation of phenylalanine, which is toxic and if untreated will cause intellectual disability, behavioural problems, seizures and microcephaly. Treatment is simple and effective: dietary restriction of phenylalanine and supplementation of essential amino acids. Regular monitoring of blood spot phenylalanine allows real-time manipulation of dietary therapy and active management. Patients are taught how to collect blood spot samples at home, which are sent to the laboratory via first-class post. The laboratory reports results directly to the metabolic dieticians, who liaise with the patients and families and advise on dietary management.

The need to improve the PKU monitoring pathway was first identified in 2012. A key performance indicator (KPI) had been introduced that tasked the laboratory with reporting 90% of PKU results by 4 pm on the day of sample receipt. The evidence base for this KPI was linked to workload, analysis time and requirements of the user, however the lab was consistently failing it, reporting only 74% of samples by 4 pm on the day of receipt.

The initial investigation took the form of a critical review of the existing process and recommended application of A3 methodology to facilitate improvement.

In January 2013, a project team was established with a representative from each stage of the sample pathway: a biomedical scientist, clinical scientist, metabolic dietician, medical laboratory assistant and patient with PKU. The problem statement was defined as 'The PKU monitoring turnaround time (TAT) does not currently meet the needs of the metabolic dieticians who require the results to be available at 4 pm daily'. The team undertook a pathway walk, which started with a patient collecting a blood spot sample at home and ended with the dietician telephoning the result to the patient. Data was collected to enable the current state to be clearly defined and significant amounts of waste were identified: transport, waiting and over processing. A fishbone diagram was used to help determine the root cause(s) and identify suitable counter measures. The agreed goal was to meet the existing KPI and report 90% of all PKU monitoring results by 4 pm on the day of sample receipt. The current state data supported this as a realistic target and the team began to implement the changes. In January 2014, the lab met the KPI for the first time and between January and June 2014 an average of 97% of results were reported by 4 pm (range 90–100%). The real success of the A3 methodology is evidenced by the fact that this change has truly been sustained. In 2015, 94% of results were reported by 4 pm and in 2016 (up to and including September) 93% of results were reported by 4 pm.

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Putting the 'monitor' back into PKU monitoring

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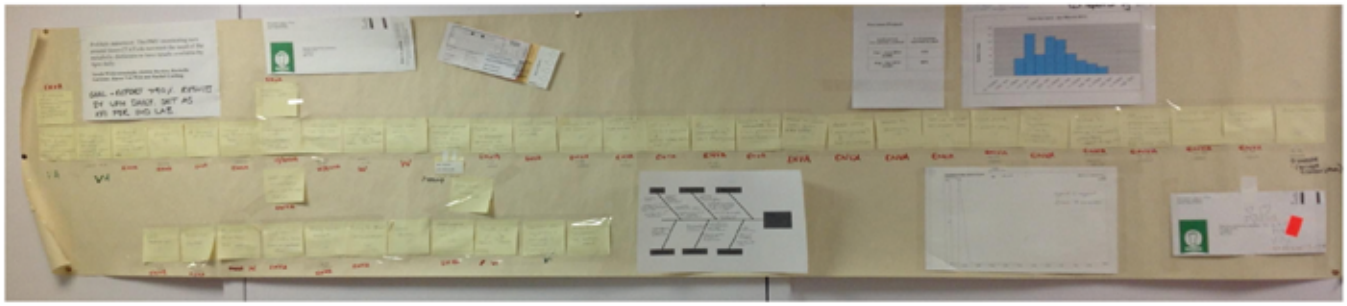
Define the problem/opportunity

Patients with phenylketonuria (PKU) require routine monitoring of their blood phenylalanine levels to optimise their ongoing treatment and management. The Metabolic Dieticians at the Evelina London looking after these patients require timely reporting of phenylalanine monitoring results to enable them to contact patients with their results and communicate any required changes in their treatment.

Problem statement: The PKU monitoring turnaround time (TAT) does not currently meet the needs of the Metabolic Dieticians who require the results to be available at 4pm daily.

Current state



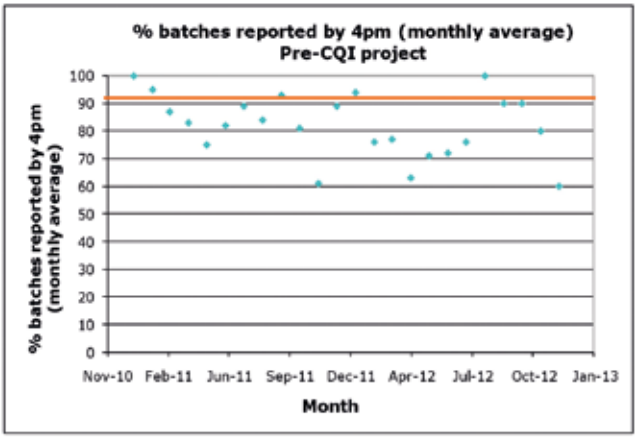
Patient	Royal Mail	PO box	CSR	IMD laboratory	Fax	Dieticians	Patient

- *Pre-CQI project audits of PKU monitoring TATs:*
Feb-Jun 2012 (n = 80 days) - 73% of PKU monitoring results reported by 4pm
Aug-Dec 2012 (n = 80 days) - 84%

- *Workload:*
Between Sept 2010-Dec 2012 - average 14 samples per day (range 0 - 72)

- *Average time spent on each stage (n = 7 days):*

Stage	Mean (mins)	Range
Pre-analytical	70	50 - 105
Analytical	121	52 - 170
(Actual analysis time)	*(59)*	*(14 - 110)*
Post-analytical	86	55 - 126
Total time	**277**	**235 - 345**
Time per sample	**15**	**8 - 23**



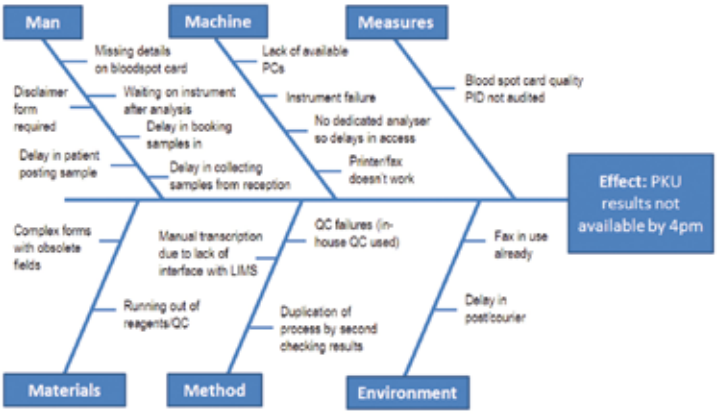
Goal

To report 90% of all PKU monitoring results to the Dietician's by 4pm on the same day of receipt, excluding those that arrive once the batch has been started.

Waste identified

- *Pre-analytical:* **Delivery** of the samples alone involves the patient, Royal Mail, collection from the PO box by a courier, Specimen Reception, and the MLA or BMS in the laboratory. Newborn Screening is also involved as samples for both sections arrive in the same envelopes and therefore need to be separated out.
- *Analytical:* Samples **waiting** on the analyser to be processed.
- *Post-analytical:* **Over-processing** - all results checked by two independent people prior to release. The Dieticians spend time dividing results into those for adult and paediatric patients.

Root cause analysis



Future state

Shortened pathway due to:
- Removal of waste steps in the three main stages of the pathway, including reduction in waiting and over-processing steps.
- Raising awareness in the laboratory of the importance of making the results available in a timely manner.

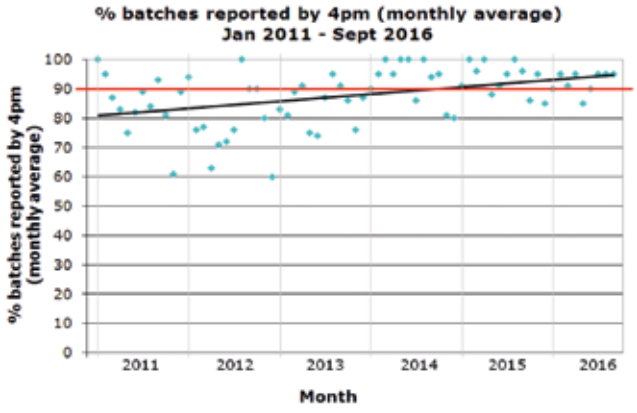
Action plan

Action	Who?	When?	Progress status
Raise awareness in the IMD lab of the importance of reporting results by 4pm	All in IMD	Ongoing	Continuous feedback via KPI
Train more staff in performing the PKU monitoring assay	All in IMD	Ongoing	This assay is one of the first that new starters are trained in
An MLA to book samples in whilst the BMS prepares the analyser	All in IMD	Aug 2012	Complete
Modified envelopes to enable easier and quicker identification of PKU monitoring samples from NBS samples	F Ghoni	Aug 2012	Complete
Remove the requirement of full second check of results if BMS is state-registered	F Ghoni	July 2014	Complete
Delivery of PKU monitoring samples directly to the 4th floor NBS lab	Courier	April 2014	Complete
New LIMS system interfaced to mass spectrometer	Viapath IT	2015	Overdue
Use Excel for recording QC (more accessible)	F Ghoni	March 2014	Complete
Re-calibration of the assay to a traceable standard	F Ghoni	Jan 2014	Complete
Strengthening the relationship with the Dietetic teams	E Mozley	Ongoing	Talk and tour planned for February 2017
Use of email instead of fax, and results separated into Adult and Paediatric results lists	F Ghoni	June 2015	Complete
New mass spectrometers to increase capacity/availability	R Carling	Oct 2015	Complete

Results and measures

The majority of actions are now complete, with the exception of an interfaced LIMS system. Further actions have been added and completed since the CQI project was written up; this is an ongoing improvement project.

This graph shows the improvement in the KPI over the past six years.



Next steps

Continue to raise awareness of the importance of reporting PKU monitoring results by 4pm daily. This is emphasised by the fact that PKU monitoring is a KPI within the IMD laboratory.