Improving immunocompromised patient care through streamlining Microbiology diagnostic pathways

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1. Aim and background

Fungal infections in immunocompromised patients are a significant cause of morbidity and mortality[1] and the primary reasons are twofold:

- Patients may not show signs of infection
- Tests looking for infection may be negative[2]

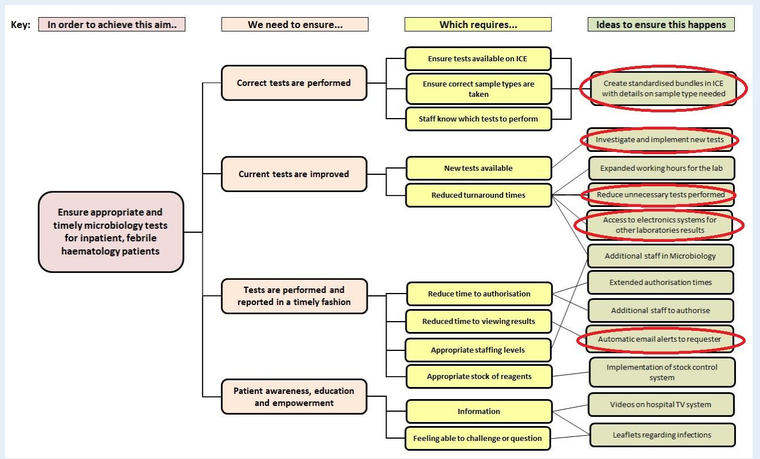
Additionally, despite advances in the medications used to treat these infections, the frequency and mortality associated with the infections has not reduced in two decades[1]. One reason is the lack of timely diagnostic tests.

Aim: Improve care for immunocompromised patients with potential fungal infections by reducing the time to results for diagnostic tests. This was measured to determine if improvement had taken place. The overall measure of improvement was the amount of anti-fungal medication used by the ward over the course of the project.

2. Project design

Initial investigations:

1. Literature review to determine what has led to improvements in other hospitals,
2. Spending time with the Haematology team to understand their service,
3. Creating an online Kanban board to collate ideas and keep the project team up to date.



Driver diagram: a method of working through potential changes. The themed changes are highlighted using red circles

Determining which changes to make:
A driver diagram was created to discuss areas of improvement.
Two themes emerged – improved use of IT systems and timely Microbiology results.

Two lab tests were deemed relevant to the length of time anti-fungal medication were prescribed.
Both of these tests are currently performed at other labs:

1. β-D-glucan: a test looking for parts of the fungus.
   A positive result is highly suggestive of fungal infection while a negative result would likely rule it out.
2. Respiratory virus PCR: a test which determines if a respiratory virus is present.
   A positive result could allow cessation of anti-fungal medication.

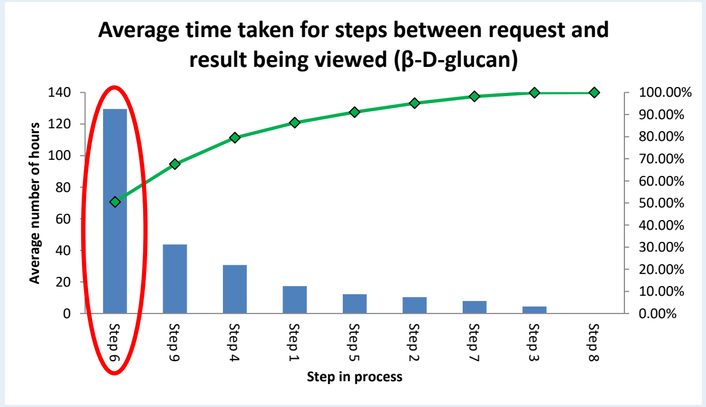
A process map was created to look at steps in the test process while IT solutions were discussed.

3. Where to improve?

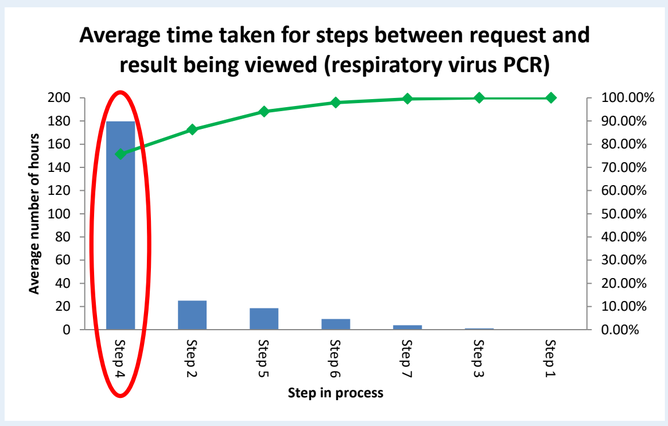
Twenty samples for each test were analysed and each step in the process was timed. Using Pareto charts (see below), I determined which steps took the most time.

Largest bar: time between result being available at the other lab and being entered into our system.

This involved getting results in the post and entering them manually into the lab IT system.



Pareto chart for β-D-glucan test: each bar is the average time for each step in the process



Pareto chart for respiratory virus PCR test

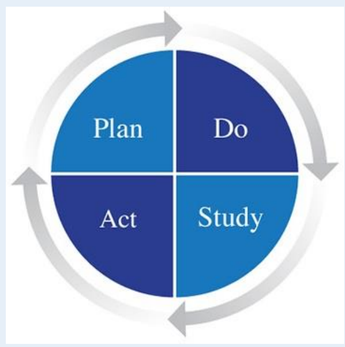
Largest bar: time between sample being sent and the result being available.

This involved transport, getting results in the post and entering the results into the lab IT system.

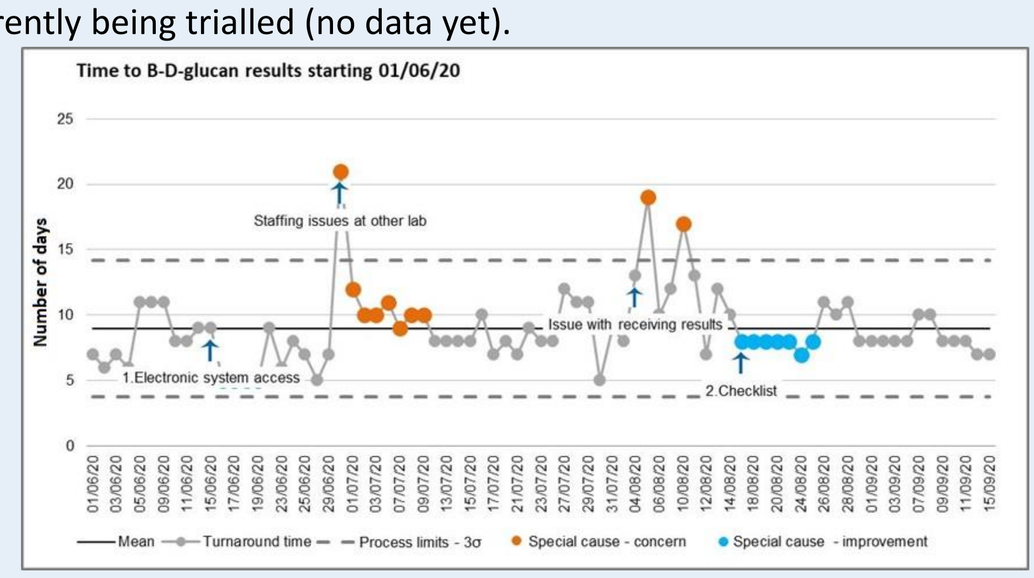
4. Examples of PDSA cycles

Examples of changes:

1. Got access to other lab results system, but impact depended on which staff were working, levels of self-isolation/sickness and workload.
2. Checking the electronic system was added to a checklist, but the checklist was too long and other work was deemed more critical when staff were under pressure.
3. Performing the tests at our lab would cut out several time-consuming steps rather than one. This is currently being trialled (no data yet).



The PDSA cycle: my method for making and monitoring changes



SPC chart: highlighting times of change and their impact on time taken

5. Outcomes and Lessons Learnt

Outcomes

The primary aim of the project was not met as antifungal use did not reduce over the course of the year. However, some positive outcomes were seen:

- Reduction in the time taken to get results was seen towards the end of the project with a continuing downward trend indicating this is likely to continue.
- As a result of this project, these tests are being introduced into my department, therefore the time to results should further improve and stabilise. I plan to continue this project in the new year to determine if this has been a success and modify the process further as necessary.

Lessons learnt

- You can't do it all! Getting a team engaged means you can achieve more than you imagined.
- Don't assume you have all the answers. The individuals performing a specific task will provide useful information, suggest viable and sustainable change ideas and this process will create further engagement and ownership of the project.
- Choosing a subject matter I was not familiar with made the project a more challenging, but more rewarding experience while meeting new individuals/teams and exchanging knowledge.
- Try and prepare for the unexpected! The pandemic led to increased challenges such as trying to reengage staff during a difficult time and staff sickness leading to changes taking longer.

6. Thanks and References

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References

1. Pfaller, M and Castanheira, M (2016) Nosocomial candidiasis: antifungal steward ship and the importance of rapid diagnostics. Medical Mycology, 54: 1-22
2. Török, E; Moran, E; Cooke, F. (2009) Oxford handbook of infectious diseases and microbiology. 1st edition. Oxford University Press: Oxford, UK.