An assessment of the importance and impact of improving laboratory test turnaround time (TAT) in the acute care sector – is this an area that should be better funded and prioritised?

Management summary

- Pathology services are under pressure to improve performance following Lord Carter’s latest report, Operational productivity and performance in English NHS acute hospitals: Unwarranted variations (February 2016)¹

- The Review sets timelines for productivity improvements and encourages trusts to consider laboratory mergers and consolidation

- This paper presents evidence of the contribution to overall healthcare effectiveness made by pathology, including a qualitative study of laboratory managers and principal biochemists

- It also raises two critical issues:
  1. Given the headroom for technological and procedural reform in pathology (leading to substantial productivity improvements), surely these options should be explored within the existing pathology network before mergers and consolidation are encouraged? Are the deadlines set by the report commensurate with this?
  2. Increasing demand for healthcare, and consequently for pathology services, has not been met by a parallel increase in pathology budgets. Yet, given the disproportionately positive contribution made to improved patient outcomes, and therefore the management of overall healthcare demand, should greater resources not be devoted to pathology services? Should pathology budgets be rising at a higher rate than healthcare demand growth, not a lower one?
**Pathology services improvement and investment – the time is now**

The NHS is charged with achieving ‘efficiency savings’ targets without undermining the quality of patient care and outcomes. Whether or not one agrees with the notion of such targets, and regardless of views on their viability and achievability, they exist and are a commitment from the central authorities. As such, there is a burning need to find areas of healthcare where greater investment may help reduce the requirement for other (more expensive) therapies and interventions down the line.

Patient diagnostics is widely recognised to be an area where improvements can have a disproportionately positive impact on patient outcomes, duration of treatment and overall cost. There are three areas where such improvement may be sought: accuracy and reliability of testing; speed of results; and access to results by clinicians and care professionals. Logically, it should therefore surely be an area for disproportionately higher allocation of resources. In fact, this is not the case. Investments now generally have to be made on a ‘spend-to-save business’ case. This has given rise to pioneer NHS trusts acting on the simple logic that improvements in pathology services produce better patient outcomes, help minimise the amount of ‘treatment’ each patient consumes, and help contain and reduce costs. To quote just one Trust laboratory initiative, “Getting faster, more accurate microbiology results saves lives as it means we can provide the best treatment sooner.”

Looking at one pertinent, notoriously difficult to identify, and potentially life threatening condition in particular, it is clear throughout the new NHS guidelines for improving outcomes for patients with sepsis that increasing the speed of diagnosis is viewed as vital for prompt and effective treatment. Further recognition of the impact and return on investment from improved laboratory services is witnessed by the emergence of spin-off joint ventures between trusts and commercial partners.

However, the Pathology Modernisation Programme and the recent Carter Review both recognised the need for a change of scale for pathology services with a focus on internal efficiencies within the test production process. In other words, demand for pathology services rises with overall increasing demand for healthcare, and improvements are needed simply to manage current requirements.

Accordingly, this short research note reviews one particular aspect of laboratory services’ efficiency: test turnaround times (TAT). Although one of several factors, TAT is a fundamental enabler - providing more test results, more quickly, back into clinicians’ hands. This report also presents original research amongst laboratory and chemistry managers that underlines how important turnaround times are seen to be in improving pathology services.

“There is extremely important as laboratories have to meet targets and therefore need to be more efficient.”

Pathologist, South West England
Pathology services lie at the heart of healthcare. They are essential to the delivery of many of the national priorities and targets for the NHS, with around 33,000 people employed in over 150 NHS England organisations responding to approximately 200 million pathology services requests a year. It is estimated that 70-85% of clinical decisions affecting diagnosis or treatment involve a pathology investigation, with individuals’ treatment decisions – and the monitoring of their response to treatment – often dependent on a range of pathology-based tests and investigations. Nearly 800 million pathology tests are performed each year in England and Wales, which means that 30,000 patients have a test each working day.

Despite this our laboratories can be seen as rather good value; overall, pathology services – from taking the sample to communicating the result - only cost the NHS an estimated £2.5 billion per year, of which the single largest element is the workforce. An Australian study on the economic value of pathology notes that, “[spending on pathology] is a small investment relative to the benefits of pathology in ensuring patient health is maximized.” The previously mentioned recent Carter Review found that, as a broad high-level measure, pathology services costs as a proportion of trust operating expenditure ranged from < 1.5% to > 3.0%. This latest report from Lord Carter notes that, “Trusts should ensure that their pathology and imaging departments achieve their benchmarks as agreed with NHS Improvement by April 2017, so that there is a consistent approach to the quality and cost of diagnostic services across the NHS. If benchmarks for pathology are unlikely to be achieved, trusts should have agreed plans for consolidation with, or outsourcing to, other providers by January 2017.”

Certainly, a national consistency standard in pathology is desirable; however, the response from the Royal College of Pathology to this report warns against knee-jerk moves to consolidation (amongst other matters). It is the view of the authors of this paper that there is room for efficiency gains in each existing laboratory, which should be explored long before consolidation between laboratories is considered. It certainly seems strange that trusts which are already hitting the Carter 1.6% pathology productivity target should still be required by NHS Improvement to submit consolidation plans. Perhaps the biggest mistake would be to unwittingly encourage under-investment in pathology, with far greater health and cost outcome ramifications down the patient pathway. As the previously cited Australian study notes, “If pathology is undervalued and underfunded, prevention and diagnosis opportunities will be missed, leading to expensive end-stage treatments and the high personal costs of poor health.”
It is no secret that the NHS is currently under extreme pressure, and expectations to deliver ‘efficiency savings’ of 2-3% per year are effectively setting a 10-15% real terms cost reduction target for achievement by April 2021\textsuperscript{23}. With demand across virtually all disciplines of pathology rising at an average of 10% per year\textsuperscript{24}, how can hospital laboratories ensure improved efficiency without compromising on quality?

**Improving patient outcomes and length of stay**

Improving patient outcomes is the most important goal of all hospitals, and one key factor in achieving this is an ability to minimise patient stay, whilst also ensuring the highest quality care. Moreover, reduced patient stay equals reduced costs; the NHS Institute for Innovation and Improvement cites a case study example; whereby one trust calculated that reducing the average length of stay of a routine procedure by one day would result in an annual saving of approximately 35,400 bed days, equating to £8 million (based on a bed day cost of £225)\textsuperscript{25}. A US study estimating the economic impact of a half-day reduction in LOS among patients with community-acquired pneumonia, concluded estimated savings of $457 to $846 per episode or $500-$900 million annually for the US\textsuperscript{26}.

Looking at emergency departments (ED) in particular, it has been documented that hospitals are looking for ways to reduce ED bed-blocking and LOS, both of which are associated with higher rates of preventable medical errors and poor patient outcomes, including increased mortality\textsuperscript{27}. Another US study on the financial impact of ED bed-blocking concluded savings of $3.9 million a year for a university hospital, if they eliminated ED bed occupation of adult admitted patients by improving movement to the inpatient setting\textsuperscript{28}.

Looking at the UK equivalent, the Kings Fund has reported that “using hospital beds more efficiently could save the NHS at least £1 billion a year and deliver benefits for patients”. The think tank has also stated that “more than 70 per cent of hospital bed days are occupied by emergency admissions” and “10 per cent of patients admitted as emergencies stay for more than two weeks, but these patients account for 55 per cent of bed days”\textsuperscript{29}.

Although there are many factors which can impact patient LOS, the ability of pathology services to provide fast and reliable test results will, of course, be essential. One recent study\textsuperscript{30}, examining the relationship between laboratory testing and ED LOS, states “laboratory test results are crucial to diagnostic workup and patient management decisions and thus a potentially important contributor
to ED patient flow\textsuperscript{31}.” A study published in the Journal of Health Organisation and Management on ways to reduce patient TAT and improve service quality in EDs also found that waiting time comprised 51-63% of total patient TAT in the ED, with one of the major components being waiting time for blood work\textsuperscript{32}.

Therefore, any steps that can be taken by hospital laboratories to reduce test TAT are a critical factor in improving patient outcomes. A 2014 report from the National Pathology Programme cites that “around 95% of clinical pathways rely on patients having access to efficient, timely and cost effective pathology services\textsuperscript{33}.”

Faster laboratory TAT is acknowledged to be desirable for various reasons by many experts who recognise that “the more timely and rapidly testing is performed the more efficient and effective will be the treatment”\textsuperscript{34}, and that “it is almost axiomatic that providing a more rapid result saves time and therefore money”\textsuperscript{35}.

An 11 hospital study\textsuperscript{36} on reducing laboratory turnaround time explains that “because 60% to 70% of the objective information on the patient’s chart is laboratory information, it follows that delays in reporting laboratory results would cause a concomitant delay in the diagnosis and management of patients.” As well as the financial and patient care benefits, the study found that the resulting reduction in patient LOS also reduced ambulance diversion.

A study\textsuperscript{37}, which examined the relationship between laboratory testing (including test volume and turnaround time) and ED LOS, using linked patient-level data from four hospitals across four years, found that “on average, for every additional 30-minute increment in test TAT, there was a 17-minute increase in median ED LOS.” The study concludes that “laboratory service performance affects ED length of stay through the time needed to process laboratory test requests” and that “variations in clinician practices and laboratory performance are suitable targets for quality improvement.”

As this study acknowledges, these findings provide empirical confirmation of a previous simulation study estimating the effect of decreasing TAT on ED efficiency, which showed that a 60-minute reduction in TAT (from 120 to 60 minutes) was estimated to produce a 30-minute decrease in ED LOS (from 166 to 136 minutes)\textsuperscript{38}.

It can be safely argued that in improving the time-to-result and therefore reducing patient stay, patients will be able to move through the care pathway more quickly and thus help alleviate the burden on high intensity zones, such as A&E.
Added to this is the fact that all laboratories are now (as of April 2015) encouraged to work to the Key Performance Indicators (KPI) set by The Royal College of Pathologists (RCP) of 90% of result reports of key blood tests from emergency departments being available within 60 minutes of sample collection. This, as the RCP itself acknowledges, is a challenging best practice standard and provides even more emphasis on the need for solutions to enable faster TAT.

The impact of laboratory TAT on patient outcomes and LOS is clear, but how are TAT improvements perceived by laboratories carrying out the tests and the clinicians carrying out the patient care?

“We are under a lot of pressure to save money; the lab has KPIs against TAT and we have to explain if we don’t meet them. We have stringent quality standards to stick to… Quality does affect TAT as, if a sample has reduced quality, we have to do the test again, which then impacts on TAT. The level of quality you can achieve does depend on the technology/equipment you have.”

Laboratory Manager Biochemistry, North West England

**Importance of turnaround time**

In order to build a picture of the significance of reducing laboratory TAT, MindMetre, an independent research organisation (www.MindMetreResearch.com), investigated views of NHS hospital laboratory managers and principal biochemists in England and Wales on the key aspects of laboratory services they feel are most important to clinicians and the effect reducing TAT would have on the patient pathway. Whilst respondents were commenting on this issue as it applied to emergency, acute treatment, chronic condition management and long-term stay environments; anecdotal comments from those interviewed indicate their perception that TAT improvement benefits are most keenly felt in A&E.

The results reveal that, out of a list of 15 key aspects of laboratory services, “inpatient stat test TAT” is viewed as the most important service to clinicians. “routine test TAT” was also in the top five aspects of laboratory service considered by laboratory managers to be most important to clinicians, along with “critical value notification”, “quality/reliability of results”, and “accessibility of pathologists”.

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Perhaps of equal value to the research is the anecdotal evidence that was also gathered during the interviews. The overwhelming majority of laboratory managers and biochemists interviewed were very eloquent in their views on the importance of test TAT to them, and the positive impact on the patient pathway of being able to reduce TAT.

The overarching theme was the importance and benefits of fast TAT. Comments such as: “Test turnaround time is really important for moving patients quickly”; “Quick TAT to enable quick treatment is very important”; “TATs are very, very important as results are required for immediate treatment and diagnosis”; and “Improving test turnaround time is exceptionally important to improve clinicians’ daily work” were unanimous.

Key points that were frequently made were:

- Test TAT impacts on patient LOS/bed stay
- The ability to provide fast test TAT helps improve, and provide better understanding of, disease management
- Laboratories are under immense pressure to ensure cost and efficiency savings
- Laboratories should adhere to tight TAT KPIs from The Royal College of Pathologists (60 minutes from sample to reported result)
- Laboratories have stringent quality standards to adhere to, and clinicians rely on automatic high quality
- The level of quality achievable depends on the technology/equipment available
- Certain aspects of the testing process, such as the speed at which tests reach the laboratory and the quality of the sample, are out of laboratories’ control, so any measures to help speed TAT in the laboratory as well as ensuring high quality would be of great benefit
- Technologies that improve test TAT will be very valuable

Aspects of laboratory service considered by laboratory managers to be most important to clinicians

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<td>Accessibility of pathologists</td>
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<td>Routine test TAT</td>
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*stat indicates test results that are urgently needed for diagnosis or treatment
Looking in particular at the knock-on benefit of reduced test TAT on the patient pathway as a whole and the services hospitals can offer to patients, a few key quotes stand out:

“Benefits of improving the turnaround times mean that we can serve our patients more quickly, we can send patients home more quickly, and release beds in the hospital more quickly.”
(Deputy Laboratory Manager, South West England)

“Improvement in test turnaround times is really important for the acute area. It is one of our goals and is currently on our agenda. Such improvement may positively impact our organisation with more rapid diagnosis and treatments. This would allow a larger number of free beds and a better service.”
(Lead Biomedical Scientist, South West England)

“The positive impact of improved TAT would be better management of patient flow in hospitals and the ability to discharge patients more quickly. Most important for the laboratory is that the reporting and results are available more quickly and that one meets targets more quickly. In the end it is simply profitable.”
(Laboratory Manager, South West England)

It was also specifically acknowledged by several laboratory managers that improving TAT, and therefore patient management, would also help the laboratory and hospital/trust as a whole to save money:

“Improving test turnaround times is very important, not only for the patient, but it would mean a financial saving for the laboratory too. The quicker you get the information, the quicker you make decisions, which can be critical in some cases.”
(Blood Sciences Manager, Wales)

“Turnaround time has to meet requirements and allow patient management decisions. It is about making economic use of hospital resources, so saving money... It would also help effective bed management - the more beds you can release, the more unscheduled patient care you can offer.”
(Laboratory Medicine Lead Service Manager, Wales)

But even more telling is the fact that some who took part in the survey particularly said that improving TAT was a top priority for them, and that they felt it was their duty to ensure that laboratory services were as effective and efficient as possible:
“Improving turnaround times is our number one priority, because of the pressure we have in discharging patients. As for the patient pathway, it will hopefully improve the patient experience and speed up discharge procedures.”
(Laboratory Manager, South East England)

“It is our job to continue to try and improve turnaround times, as there is clinical need for it. It would have a huge impact on the patient pathway and would help improve the service provided to patients and meet clinicians’ targets.”
(Laboratory Manager, Wales)

“We try very hard to keep improving turnaround times, and our goal is to push the delivery of results so that patients can be discharged sooner. It would have a huge impact on the patient pathway, enabling clinicians to administer timely and appropriate treatment and monitoring, as well as correct drugs and dosage.”
(Biochemistry Manager, South East England)

**Clinician satisfaction**

It is clear that, along with quality and reliability, test TAT is a critical factor in ensuring laboratories can provide a good service to clinicians, helps reduce patient LOS and therefore, presumably, clinician satisfaction with the service they are receiving.

As a paper on timeliness of laboratory results cites: “timeliness in reporting of laboratory results undoubtedly affects clinician and patient satisfaction as well as length of hospital stay... Slow results reporting, even for routine testing, has a number of adverse effects. In addition to physician and patient dissatisfaction, slow TAT can lead to duplicate test requests and increased stat testing.”

Satisfaction of both clinicians and patients in the acute setting is a key pressure that laboratories need to work hard to maintain. One study specifically on laboratory turnaround time advises:

“Turnaround time (TAT) is one of the most noticeable signs of laboratory service and is often used as a key performance indicator of laboratory performance... TAT continues to be a cause of customer dissatisfaction with the laboratory service... At a time when clinicians have increasing options for their diagnostic testing, laboratories cannot afford to have unhappy customers. To disregard TAT as a measure of laboratory service quality is dangerous given its importance to clinicians. The laboratory needs to manage clinician expectations and demonstrate that it is meeting those expectations... Improved TAT can be the key to greater user satisfaction with the laboratory.”

So the necessity to improve laboratory and test TAT is even clearer, but what is the best way to go about it?
Improving TAT through innovation

One of the main arguments of this study is that there is room for TAT improvement, without any loss of test result quality, through procedural and technological improvements in the laboratory network as it currently stands. Laboratory mergers and consolidation should not be considered before stand-alone TAT improvement initiatives have been exhausted. To this extent, the authors of this study agree with the response to Lord Carter by the Royal College of Pathologists.

Let us look again to the clinical evidence. “Improving turnaround time is a complex task involving education, equipment acquisition, and planning. All the steps from test ordering to results reporting should be monitored and steps taken to improve the processes”, continues the study on laboratory results timeliness.

The 2008 Report of the Second Phase of the Independent Review of NHS Pathology Services in England for the Department of Health, chaired by Lord Carter of Coles, states that “a small investment in pathology services can disproportionately improve the quality and lower the total cost of a healthcare encounter.” It is clear that investment is required in order to significantly reduce test TAT, and hospital laboratories should be looking to the range of innovative new technologies now available to help them achieve the 60 minute KPI set by The Royal College of Pathologists.

In fact, the importance of embracing innovation is a key message of the report, which makes it clear that “providing services which are swift to adopt innovative technology and practices, where effectiveness is proven” is a key aspect of the authors’ vision for NHS pathology putting patients first. The authors also “recommend that the Department of Health identifies ways to facilitate the adoption of innovation in pathology.”

Highlighting the necessity for innovative technologies to streamline laboratory processes, an Australian study on the impact of pathology processes on ED LOS found that a redesigned pathology process resulted in a 29-minute reduction (15.6%) in the median ED LOS for all patients, and the Health Foundation cites an estimation by Monitor (part of NHS Improvement) that clinical redesign and process improvements in acute care could deliver productivity savings of between £1.1-2.3 billion.

This is, again, supported by the views of laboratory managers who took part in the research, with one stating: “Good technology is where one should concentrate ... By improving test turnaround times, results would become available more quickly for medical staff use.” (Laboratory Manager, North West England)
But, as well as innovation being of benefit to the laboratory testing setting, it would be wise to review the full test process – from sample to result – in order to ensure that any new technologies or measures adopted are of maximum benefit. As sample quality was one aspect highlighted by laboratory managers as being out of their control, but with an impact on the test TAT and result reliability, it would be wise to take steps to try and ensure maximum sample quality as well as focusing on laboratory processes.

As one laboratory manager commented: “I agree with the notion that improved test turnaround times would have a big impact on effectiveness to serve people. However, rather than looking at the mere turnaround time of the tests in the laboratory, we are looking at improving the whole process... It is important to optimise the whole process in order to keep patients as happy as possible.” (Haematology & Biochemistry Operations Manager, South West England)

Conclusions

Evidently laboratories in the acute setting are very aware of the importance of providing a fast but high quality service to clinicians, in order to deliver the highest quality of care to patients. Being able to achieve this at a time of increased cost pressures and efficiency expectations is certainly a challenge to laboratory managers, however, as one of the studies discussed above mentions, “LOS in the ED can be significantly reduced by simple changes to pathology processes”\(^ {47}\). Of course, the true impact of pathology services can only be properly appreciated when tracked from laboratory performance through to improved patient outcomes.

It is important to highlight that the Report of the Second Phase of the Independent Review of NHS Pathology Services in England\(^ {48}\) notes: “Innovation in pathology may bring greater benefits for other service specialties, so it will be important to base evaluations on the impact across the individual’s entire pathway through care.” The above discussion has shown that key improvements to laboratory processes can have a lasting impact on a patient’s acute care journey. Resorting to laboratory mergers should be the last, not the first, strategy – and only once initiatives to improve process and technology have been exhausted.

This research note from MindMetre highlights the critical importance of laboratory efficiency in ensuring a sustainable health service. Any innovation in the laboratory environment to reduce turnaround times should produce disproportionately high return on investment, and is therefore worthy of attention not simply from laboratory management, but potential investment from board level in an NHS trust. MindMetre will now be gathering evidence of such business cases into 2017 to present in aggregated form to the relevant stakeholders.
Research Methodology

MindMetre Research carried out in-depth interviews with 30 hospital laboratory managers and principal biochemists in England and Wales who were asked to rate key aspects of laboratory services in the acute setting according to what they believed were most appreciated/valued by clinicians requesting tests, how satisfied they felt clinicians were with the services they receive from laboratories, and their particular views on the effect of TAT reducing on the patient pathway.

Figure 2: Aspects of laboratory service laboratory managers were asked to rate according to importance to clinicians

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About MindMetre

MindMetre Research is a leading consumer and business analyst. The organisation has been investigating and publishing on trends in a number of fields and sectors since the late 1990s, particularly healthcare, web technology, financial services and marketing. MindMetre research programmes are regularly conducted across the globe, embracing geographies from the Americas to the Far East. In the healthcare sector, MindMetre is particularly known for its series’ on healthcare financing, beginning in the early 2000s, healthcare worker safety and sharps injury prevention, and healthcare acquired infections. For further information go to: [http://www.mindmetreresearch.com/](http://www.mindmetreresearch.com/)
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