

# Quality improvement project to improve blood test time to results on the acute surgical unit in North Devon District Hospital

Thomas Hubbard <sup>1,2</sup>, Sam Nugent,<sup>2</sup> Rob Bethune,<sup>1</sup> Ceri Beaton<sup>2</sup>

**To cite:** Hubbard T, Nugent S, Bethune R, *et al.* Quality improvement project to improve blood test time to results on the acute surgical unit in North Devon District Hospital. *BMJ Open Quality* 2022;**11**:e001650. doi:10.1136/bmjopen-2021-001650

Received 19 August 2021  
Accepted 23 December 2021

## INTRODUCTION

Blood tests are reliable predictors of disease severity and post-operative complications.<sup>1 2</sup> Therefore, blood test results are crucial to timely decision making in high acuity emergency general surgery (EGS) inpatients. EGS patients account for a large number of admissions, necessitating a high turnover, with a high acuity of disease with a high mortality,<sup>3</sup> suggesting these patients require priority within the hospital for blood test results.

In North Devon District Hospital (NDDH), the authors noted as part of their clinical practice that blood test results requested for the morning phlebotomy round (ie, requested for 0800) of EGS inpatients were not received by the clinical team until the afternoon. This resulted in delayed decision making, including the need for surgery, investigation of potential postoperative complications, or decision to discharge home with potential to adversely affect patient care.<sup>4</sup>

Therefore, a Quality Improvement Project was instituted to investigate the delay to blood test results, with the aim of instituting a change to reduce the blood test time to result (BT-TTR) for EGS patients and facilitate more timely surgical decision making and improve patient outcomes.

## METHODS

A baseline audit was performed on the BT-TTR (minutes from request at 0800 to result) on the acute surgical unit (ASU) between 18 September 2017–22 September 2017 at NDDH (registered audit 2769). Blood tests requested or taken between 0800 and 1600 were included only, as these represent requests taken as part of the phlebotomy daily round, and blood tests that the phlebotomy team failed to collect and subsequently had to be taken by medical staff (a major cause

of delay to BT-TTR), rather than out of hours urgent blood tests taken by nursing or medical staff.

The project leads (authors SN and TH) held discussions with stakeholders (phlebotomists and phlebotomy department manager, ward managers, nursing staff and doctors from junior to consultant grade) to understand delays in BT-TTR. The baseline audit findings and discussions found that the daily phlebotomy route was dictated by hospital geography rather than clinical need—with low acuity wards (such as stroke rehabilitation wards) having blood tests taken prior to higher acuity wards such as the ASU. Taking into account stakeholder input, the quality improvement intervention changed the phlebotomy route, prioritising the ASU while taking the hospitals geography into account. It should be noted that other acute wards such as other surgical wards and the acute medical unit were also considered in the restructuring of the phlebotomy route, to ensure other high acuity settings were not negatively affected by the intervention. Ward Managers, Nursing staff and Doctors were made aware of the changes with Doctors being encouraged to ensure Pathology forms were written and made available for the Phlebotomy team by 0800. The new phlebotomy route was:

- ▶ Two phlebotomists would attend level 3 at 08:00 (general surgical and orthopaedic ward).
- ▶ Two phlebotomists would attend level 4 at 08:00 (acute surgical admissions ward, elderly care and cardiology).
- ▶ One phlebotomist would attend maternity and mental health at 08:00 and then attend level 5 (respiratory/gastroenterology and stroke) once finished.



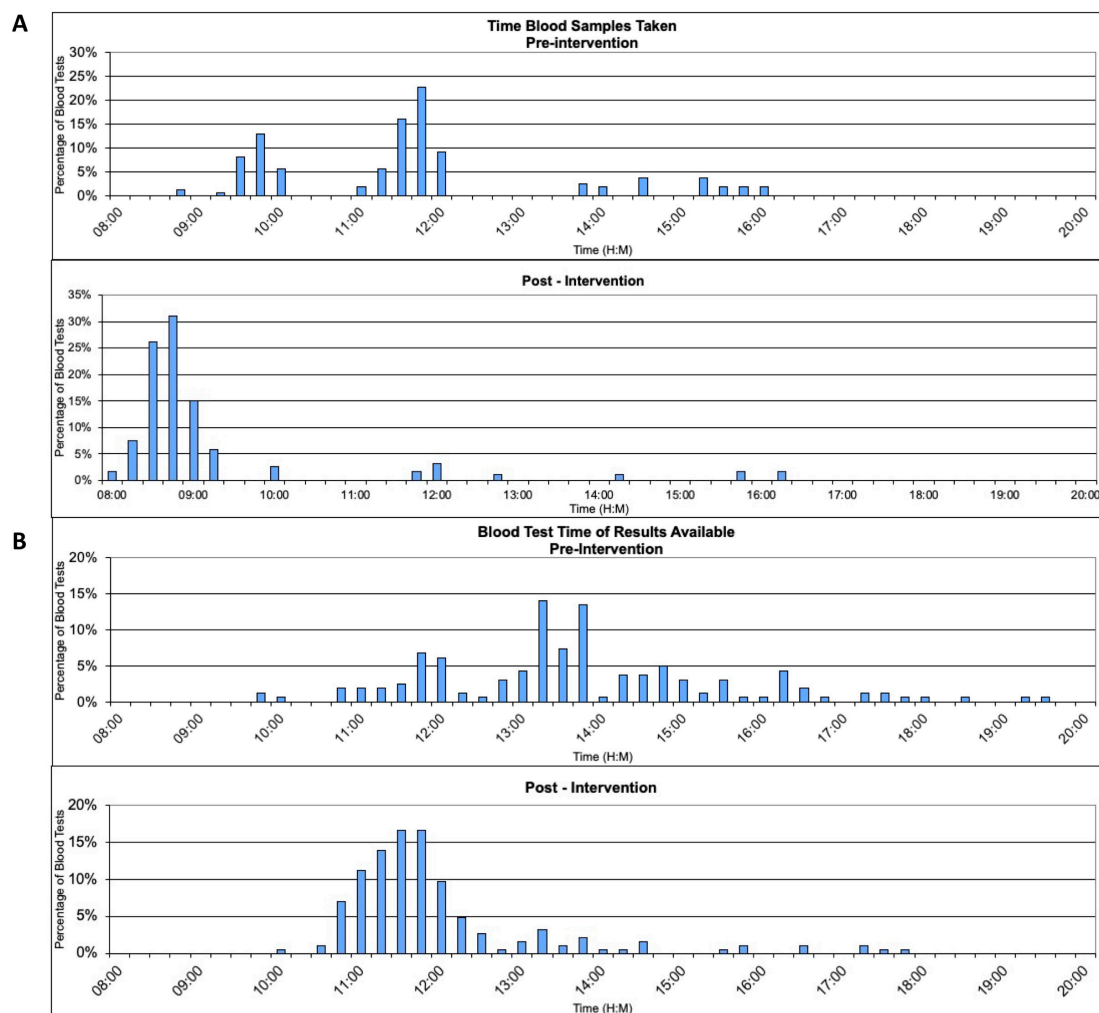
© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>Quality Improvement Academy, Royal Devon and Exeter NHS Foundation Trust, Exeter, UK

<sup>2</sup>Colorectal Department, Northern Devon Healthcare NHS Trust, Barnstaple, UK

## Correspondence to

Thomas Hubbard;  
tjehubbard@doctors.org.uk



**Figure 1** Graphs showing the percentage of blood tests at the time. (A) Time blood samples taken and (B) blood test time of results were available preintervention (18 September 2017–22 September 2017) (top graph) and postintervention (25 September 2017–29 September 2017) (bottom graph).

- Two phlebotomists would attend level 1 at 08:00 (medical assessment unit, acute short stay unit) then cover the outpatient department.
- Once level 3 and 4 complete, all phlebotomists to attend level 5.

Intervention planning took place as the baseline audit data was collected and the results informed discussions in real time. This made it possible to immediately implement the intervention once sufficient baseline data was collected to illustrate the clinical issue. Once instituted BT-TTR was reaudited between 25 September 2017 and 29 September 2017. Data were obtained from the biosciences results system (LabCentre) and analysed using SPSS (version number - 28.0.0.0) with Mann-Whitney U test, significance level  $p < 0.05$ .

## RESULTS

Baseline audit ( $n=164$ ) demonstrated median BT-TTR was 329 min (IQR 271–391.8); following intervention, re-audit ( $n=187$ ) demonstrated a statistically significant reduced median BT-TTR of 210 min (IQR 186–240)

( $p < 0.001$ ); a reduction of almost 2 hours, allowing timely decision-making. Figure 1 demonstrates the distribution of time samples were taken and when results were available before and after implementation of the change. It can be seen that in the preintervention phase blood sample collection was biphasic, representing two phlebotomists collecting samples at separate times. The intervention resulted in two phlebotomists collecting samples simultaneously allowing a single phase of blood test collection earlier (with resultant reduced BT-TTR).

## DISCUSSION

We present a highly effective QI intervention that improves care to EGS patients which is based on the local context in which it was implemented, but could be replicated in other hospital settings.

Laboratory blood testing is the most frequently requested investigation and is integral to all areas of medicine; however, most quality improvement studies to improve efficiency aim to simply reduce the number of blood tests requested by healthcare professionals.<sup>5</sup>

However, efforts to reduce demand in healthcare are often unsuccessful,<sup>6</sup> reducing the number of blood tests requested within a hospital system is highly complex, and with the frequent turnover of junior doctors, unlikely to be sustainable.<sup>7</sup> Therefore, we focused on a sustainable method of change that did not involve reducing demand, but on ensuring clinical prioritisation and improving efficiency that could be repeated and adapted according to changing clinical priorities.

A key reason for the success of this project was effective stakeholder identification and engagement. There are a wide variety of healthcare professionals and supporting staff involved with any change in a complex healthcare system, and all that will implement, and be affected by, the intervention should be involved in any such project.<sup>8</sup> Intervention success was likely due to a single phase of blood test collection earlier in the morning, and earlier completion of the phlebotomy round allowing any failed blood test samples to be taken by medical staff earlier. Our method of intervention has been highly successful in this project, and could be replicated in other healthcare settings as long as local context is considered.<sup>9</sup>

A limitation is that the original project plan had been an iterative approach of Plan, Do, Study, Act (PDSA) cycles<sup>10</sup>; however, after one cycle the re-audit demonstrated the aim of the study had been achieved. It may be possible to perform further interventions and PDSA cycles such as earlier starts to phlebotomy rounds, or night staff taking high priority bloods to reduce BT-TTR further. However, changes to staff working patterns would have a disproportional negative impact on other services for a modest improvement in BT-TTR beyond what has been achieved. The impact of restructuring of the phlebotomy daily round on other wards was also not addressed. However, the intervention only delayed the phlebotomy service on non-acute wards, where decision making is less time pressured and the intervention was done with stakeholder engagement representation from these wards.

## CONCLUSIONS

Engaging stakeholders in understanding the causality and enacting a simple, targeted change in phlebotomist daily route-planning resulted in a successful intervention. This Quality Improvement project demonstrates a highly effective cost-free intervention resulting in reduced time

to BT-TTR in high acuity surgical patients facilitating improved patient care.

**Contributors** TH confirm that all four authors contributed to the manuscript by: Substantial contributions to the conception or design of the work; or the acquisition, analysis or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iD

Thomas Hubbard <http://orcid.org/0000-0003-4593-0853>

## REFERENCES

- 1 Singh PP, Zeng ISL, Srinivasa S, *et al*. Systematic review and meta-analysis of use of serum C-reactive protein levels to predict anastomotic leak after colorectal surgery. *Br J Surg* 2014;101:339–46.
- 2 Royal College of Surgeons England. Commissioning guide: emergency general surgery (acute abdominal pain) 2014.
- 3 Royal College of Surgeons England. Emergency general surgery 2014.
- 4 Ong M-S, Magrabi F, Coiera E. Delay in reviewing test results prolongs Hospital length of stay: a retrospective cohort study. *BMC Health Serv Res* 2018;18:1–8.
- 5 Zhi M, Ding EL, Theisen-Toupal J, *et al*. The landscape of inappropriate laboratory testing: a 15-year meta-analysis. *PLoS One* 2013;8:e78962.
- 6 Turner J, O'Cathain A, Knowles E, *et al*. Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study. *BMJ Open* 2013;3:e003451.
- 7 Bagnall P. Facilitators and barriers to leadership and quality improvement Internet: The Kings Fund, 2012. Available: <https://www.kingsfund.org.uk/sites/default/files/facilitators-barriers-leadership-quality-improvement-pippa-bagnall-leadership-review2012-paper.pdf> [Accessed 06 Aug 2021].
- 8 Bourne L. *Making projects work: effective stakeholder and communication management*. CRC press, 2015.
- 9 Fulop N, Robert G. Context for successful quality improvement. *Health Care Manag Rev* 2013;38:325–38.
- 10 Taylor MJ, McNicholas C, Nicolay C, *et al*. Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Qual Saf* 2014;23:290–8.