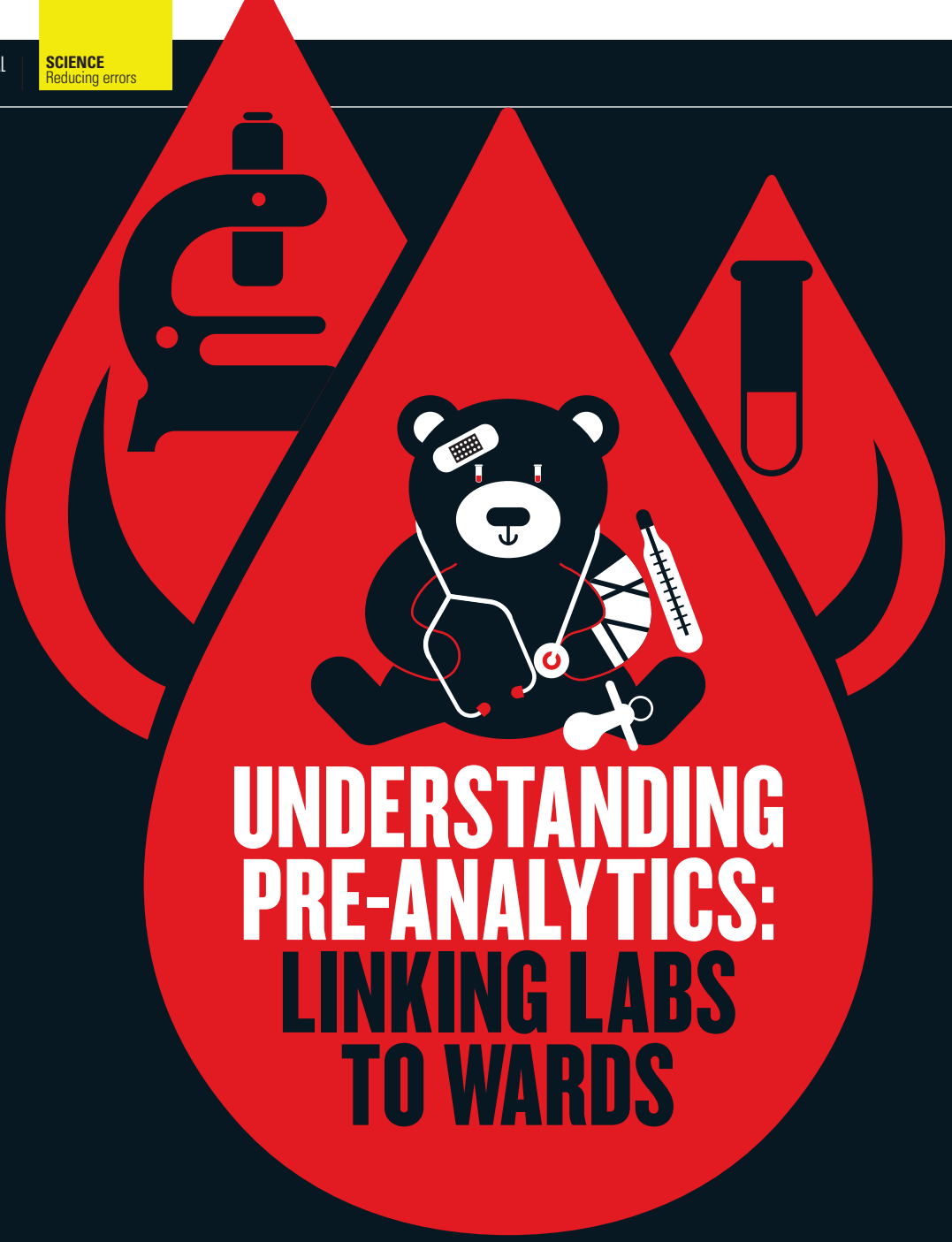

UNDERSTANDING PRE-ANALYTICS: LINKING LABS TO WARDS

Wisdom Musabaike and **Malti Nakrani** from Great Ormond Street Hospital for Children outline a project to reduce the number of pre-analytical errors.

At Great Ormond Street Hospital for Children (GOSH) the laboratory receives more than 500,000 samples and performs more than 2.1 million tests a year. An audit in 2017, which was limited to a few departments, revealed that at least 4000 samples were rejected in that year due to pre-analytical errors (PAE) alone.

High rates of rejection lead to a high rate of specimen recollection, mostly blood draws, which in paediatric patients can have significant consequences. It further contributes to delays in results being available, potential delays in diagnosis, treatment and discharge, as well as having a significant impact on patient experience.

Our mission is to always put the child first. For many of the children who come to GOSH, a daunting experience of their stay is when a needle is introduced into a vein. Paediatric blood collection is known to be more challenging because of the patient's smaller body size, low circulating blood volume, and developing physiology. Collection methods routinely used for adult patients, such as venepuncture, are not always an option for children.

Why change was needed

It is estimated that 70-85% of clinical decisions are based upon the information derived from laboratory test results, so ensuring optimal sample quality and timely delivery is crucial to the patient, the clinician and the efficiency of the

hospital. For this reason, the laboratory has a crucial role to play in ensuring that we continue to deliver the exceptional standards of service and patient-centred clinical care.

Evidence suggests that most sample errors occur in the pre-analytical phase. The ISO15189:2012 standard also recognises the importance of the pre-analytical phase by setting out requirements for laboratories under clause 5.4.

PAEs can occur at a number of stages, including test ordering, patient preparation, specimen collection and transportation. Since the activities are not performed in the laboratory, or under the control of laboratory personnel, they are harder for laboratories to monitor and improve upon.

At GOSH, the numbers of samples rejected in the laboratory due to pre-analytical reasons has been recorded for many years. However, the laboratories have had no direct control of the pre-analytical process to effect corrective actions. Data at GOSH showed the main reasons for rejection as: clotted blood, insufficient sample volumes, haemolysed or unlabelled or blood contaminated with EDTA.

In order to address these issues we have initiated the project "Pre-analytical laboratory samples project" in collaboration with the trust's Quality Improvement team, working on QI methodology. The aim is to develop the organisation's pre-analytical capabilities and to reduce the number of pre-analytical errors and improve patient care and operational efficiency. The main focus was to improve communication between the hospital staff in the clinical areas and laboratory staff, to train staff in procedures for ordering, collecting, handling, preparing and transporting biological specimens, all in order to improve the quality of samples and reduce errors in the sample pathway.

We anticipate that the project will help reduce numbers of repeated sample collections, which can be uncomfortable and distressing for patients and families, and help the clinicians involved in sample collection to manage their workload effectively. We foresee fewer delays in medical teams receiving results, enabling fewer delays in diagnosis, treatment and discharge.

Evidence suggests that most errors in the process fall outside the analytical phase

What we did

Early in 2018, we decided to explore other opportunities for improvement in sample collection practice and to implement solutions, with the overall aim of significantly reducing the number of sample rejections. The rejection of nasopharyngeal aspirate (NPA) samples due to container leaks was considered as an area for improvement. Issuing guidelines for staff to send all of these samples through porters rather than via the pneumatic tube system ("chute") reduced the rejection rate.

The weekly percentage of NPA samples rejected due to leakage has reduced from a mean of 1.79% to a mean of 0.3%. This has been sustained since March 2018.

After a "quick win" with the pilot NPA project, a steering team was formed of clinical and non-clinical stakeholders, chaired by the Medical Director and with support of the hospital's executive. Based on the reasons for rejection, four key work streams were set as integral to achieving a quality sample: collection resources; transport; training and education; and policy and guidelines.

To understand the main reasons for rejection and where the greatest areas for improvement were, we developed a real-time report statistical control process (SCP) chart on the intranet issuing data from the laboratory information system. Data can be viewed at trust- and ward-wide level and is accessible by all staff.

From the data we were able to identify that the most common reasons for rejection were: clotted coagulation test samples, insufficient/underfilled samples and labelling errors.

The causes were identified as incorrect technique when taking the sample (such as insufficient mixing or vigorous shaking), issues with the equipment (such as loss of vacuum, expired tubes or incompatible resources), or delay in transporting samples to the laboratory.

Blood must be drawn in a specific order to avoid cross-contamination between blood tubes. We found the collection

IMAGES: ISTOCK/REX-SHUTTERSTOCK

sequence used at GOSH was different to the order recommended by the suppliers of the bottles, laboratory standards and the World Health Organization. We have now changed our guideline, created new resources, and shared the rationale with staff under the banner "New Year; New Draw". It wasn't until we started looking into collection practices and having conversations outside the laboratory that we became aware of the need to standardise the order of blood draw.

Delayed transport was identified as a frequent issue. It is important that blood cultures are sent to the laboratory as soon as possible, so that any bacteria that might be present in the sample can grow, be detected and be treated.

We developed visual guides to remind staff to send these samples via the pneumatic chute system for speed of delivery. Consequently, the increased use of the pneumatic chute has seen a great improvement in the transportation of blood cultures from the ward to the laboratory. There are now very few blood cultures that are received with long delays in transport time. This means that the blood cultures can be incubated quickly, which will reduce the time to detection of pathogens that cause sepsis and allow for quicker patient treatment and management.

There are now very few blood cultures that are received with long delays in transport time

The weekly average transport time mean has reduced from 239 minutes (June 2017 to October 2018) to 148 minutes (November 2018 to May 2019)

GOSH has had a new electronic patient record (EPR) system, EPIC, since April 2019. When blood tests are requested on EPIC, the ward staff will be prompted to print a patient label for the tube and will also be reminded of the blood collection sequence in which to take their samples. We are still in the transition phase, but we envisage EPIC will have significant benefit to the PAE project.

Small changes, big returns

Our interventions have shown demonstrable quality improvements. As we move forward we will continue to develop and implement changes to reduce sample rejections. We plan to develop a training strategy and practical best practice guide with quick tips for decreasing the likelihood of a sample being rejected, particularly for paediatric patients. We're going to continue to evaluate the blood collection system in order to standardise the product from one brand. Work is in progress for implementing an alternative coagulation tube for neonates with a reduced minimum volume requirement to facilitate reduction in PAEs.

Establishing a pre-analytical project role has been key in driving this quality improvement. Countless ward visits, engaging with stakeholders, going out there and having conversations with nurses, matrons, HCAs, practice educators, all worked to connect with people who often are not aware of "why" we do things the way we do. Delivering training and education, teaching sessions, and cascading key messages have all been embedded in the work that's been done so far. Preparing visual aids, posters, screensavers, and newsletters has been the key in disseminating information. We are putting every effort into building pre-analytical relationships and closing the gaps between the laboratories and direct patient care.

We believe that laboratory scientists can make a big impact on patient pathways, and it is crucial we work with the streams of other professionals across trusts to understand pre-analytics – the "unbreakable quality chain" in linking laboratories to clinical areas. BMS

Wisdom Musabaike is Pathology Lead for Quality and Risk Manager and **Malti Nakrani** is Quality improvement Lead (Pre-analytical), both at GOSH.