



## Case study: Can using point of care (POC) blood tests in emergency paediatric units improve quality of care?

In paediatric emergency medicine blood tests are performed in those children in whom a diagnosis is unclear and often helps with decision making about the necessity for admission in these children. A C-Reactive Protein (CRP) assay is a commonly used blood test to assist with clinical decision making, particularly as a potential proxy indicator for presence or absence of bacterial infection. It is generally used in conjunction with the results of a full blood count (FBC). The test is normally performed in the hospital laboratory and, once received in the lab, results take on up to 60-90 minutes. The time from needle to result can be considerably longer.

As well as measuring the **accuracy** of the POC instrumentation against lab values at John Radcliffe (JRH), Stoke Mandeville (SMH) and Wexham Park (WPH) hospitals, we also conducted a **service evaluation** by investigating whether the introduction of POCT for CRP and FBC at SMH and WPH could:

- Provide more rapid decision-making in a range of common paediatric conditions,
- Improve patient flow and reduce waiting time for families by more rapid assessment of children,
- Improve appropriateness of antibiotic prescription.

We selected the Microsemi CRP/FBC from Horiba as the POC device for evaluation. This is a unique automated haematology analyser that can simultaneously measure FBC (19 parameters) including 3-part white blood cell differential (3-Diff) and CRP using whole blood treated with EDTA-2K anticoagulant). Results are available in 4 minutes for FBC+CRP (15 tests/hour) and 1 minute for FBC (55 tests/hour).

Laboratory staff validated and set up the Horiba Microsemi devices comparing POCT results against results from the standard laboratory analyser. A paper audit form was used to collect data on the time of availability of blood results and decision-making by the treating clinician. Laboratory held data was used to determine the agreement of results in the clinical setting with standard laboratory assays. Initial evaluations from the laboratories (JRH, SMH, WPH) concluded that the POC device was sufficiently **accurate** to continue with the evaluation in a clinical setting.

The most common presentations at SMH were abdominal pain (particularly in those children >5 years old) and fever without apparent source (FWAS). Other diagnoses were lymphadenitis, tonsillitis, gastroenteritis, deliberate overdose and haematemesis. The majority of children at WPH had an initial diagnosis of either fever or sepsis. Patients presented at the JRH with limpness, rash and fever. The differences in conditions seen likely reflect the differences in the departments.

The mean delay between the result from the POCT being available and the result from the laboratory being available was 3 hours 5 minutes. Overall the POC test was useful in **decision-making** for children with abdominal pain, FWAS, limp and petechial rash and could have resulted in an earlier decision-making approximately 75% of the times. The use of the POC machine could have shortened the time to decision making about **antibiotic use**. In one particular case the high

CRP result on the POC machine prompted urgent registrar review and initiation of IV antibiotics. The patient had pyelonephritis and use of the POC machine shortened time of decision making by 50 minutes.

By the end of the evaluation period, the team was more familiar with the machine and the logistical issues encountered were ironed out. They were not felt to represent a significant barrier to the on going use of the machine but consideration needs to be given to this when setting up the machine and standard operating procedures.

York Health Economics Consortium (YHEC) carried out an economic analysis across the three hospitals. The results indicate that the use of the Horiba POCT device would result in a modest net annual saving for each of the hospitals. The savings are the result of reduced nursing and consultant or registrar time. There are also potential savings from quicker treatment decisions when a delay could have adverse effects on the patient's condition. Other important benefits include the reduced waiting time for patients and their family and carers. The reduction in time waiting for test results can result in improved patient flow, particularly important at peak times, which might also create the opportunity to redesign process and generate further benefits.

- The CRP reader was accurate in both the WCC and CRP readings, when compared with the lab values.
- Using POC as a replacement for lab test could have resulted in more rapid decision-making in 63% of cases at SMH, 82% of cases at WPH and 53% of cases at JRH.
- For children admitted from PDU at SMH, an earlier decision could have been made in 35% of cases, saving an average of 173 minutes.
- For children discharged from PDU at SMH, an earlier decision could have been made in 87% of cases, saving an average of 109 minutes per case.
- For children referred to a speciality from A&E at SMH, an earlier decision regarding referral could have been made in 63% of cases, saving an average of 106 minutes per case.
- The POC result could have been used for more rapid decision-making regarding the use of antibiotics in approximately 52% of cases (SMH) and 65% (JRH).
- The use of the Horiba POCT device would result in a net annual saving for each of the three hospitals (£9,902 SMH, £5,700 WPH and £47,534 OUH)

#### AHSN priorities addressed

- Focusing on the needs of patients and populations
- Speeding up adoption of innovation into practice to improve clinical outcomes and patient experience
- Building a culture of partnership and collaboration
- Creating wealth through co-development, testing, evaluation and early adoption and spread of new products and services