Reducing the Costs of Haemolysis

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Introduction

Up to 30% of blood tests performed on acute medical admissions in the Emergency Department (ED) at the Royal Free Hospital were haemolysed.1 Haemolysed samples cost time and money:2
• Impacts patient safety and experience
• Delayed treatment
• Delayed discharge
• Repeated assays.

The aim of this quality improvement project (QIP) was to reduce haemolysis through a programme of education and weekly audit cycle with staff feedback.

Materials and Methods

• In September 2013, posters (Fig 1) were placed on cannulation trolleys and the back of the Emergency Department (ED) toilet doors outlined recommended changes to reduce haemolysis.3,4
• Group teaching was provided to nurses, junior doctors and emergency department assistants (EDAs) with 1:1 “shopfloor” feedback.
• Weekly audit data was shared with staff.

Baseline data was collected monthly for June-Aug 2013: haemolysis of urine and electrolytes (USE) and liver function tests (LFT) remained at 20%-22%, troponins at 10%.

Biochemistry data was collected for all processed samples on a weekly basis from Sept 1st, 2013 to Jul 31st, 2014 directly from Winpath (≈8000 samples/wk). Statistical analysis of trends was performed using linear regression analysis, in Excel.

Cost calculations used previous audit data showing that 75% of haemolysed USE / LFTs and 100% of Troponins are repeated.

Results

Haemolysis Significantly Reduced

Haemolysis of serum K+ reduced significantly over the period of audit (Fig 2):

<table>
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<tr>
<th>Monthly</th>
<th>Percentage</th>
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<tr>
<td>Sep 13</td>
<td>21.7% (136/627 samples in 1 wk)</td>
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<tr>
<td>Aug 14</td>
<td>11.8% (80/678 samples in 1 wk)</td>
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Relative risk (RR) of haemolysis (Aug 14, compared to baseline data): 0.54 (95% CI 0.45, p<0.0001)

• LFT haemolysis also fell significantly from 22.9 to 10.8% (RR 0.47; adj RR 0.47, p<0.0001).
• Troponin haemolysis (Fig 2) fell from 8% (11 samples/wk) to 4.6% (5 samples/wk) although this did not reach significance, due to small sample numbers.
• Notably, haemolysis rates on MAU and in the rest of the hospital showed no significant change.

Costs of Haemolysis

To estimate the cost savings achievable, we calculated the cost of patients being re-bled, based on assay and equipment costs (Table 1).

• The expected annual cost savings was £10,177 for a 33% reduction, and £14,965 for a 50% reduction.
• Based on the observed 45% reduction, we project that we will save £13,182 per annum in the Emergency Department (Fig 3). This has been included as a Trust QIPP.

Table 1. Assay / rebleeding costs of haemolysis

<table>
<thead>
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<th>Component</th>
<th>Value per year</th>
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<tr>
<td>Cost of repeating assays based on SLR</td>
<td>£2,233</td>
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<tr>
<td>Cost of equipment to rebleed: (butterfly, needle and vacuainer)</td>
<td>£260.82</td>
</tr>
<tr>
<td>TOTAL COSTS</td>
<td>£2,494</td>
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SLR – service level agreement. Staff time and delays to discharge were not included in cost estimation.

Equipment change

On the request of ED staff, from June 2013, we introduced the BD transfer device to allow blood that has been aspirated from a cannula to be safely transferred to a blood collection tube. This replaced the device that allows blood to pass directly from a cannula into a blood collection tube – taking blood directly from cannulae has been associated with haemolysis.

• No increase in haemolysis was seen, and lower rates of haemolysis have been sustained.

Conclusions

1. Significant reductions in haemolysis can be achieved in the ED, using educational posters, group and individual teaching, and regular feedback of audit.
2. Reducing haemolysis leads to substantial time and cost savings for front-line clinical and laboratory staff, but just as importantly has the potential to improve the quality of care and experience for patients.

Conflict of Interest: None to declare.

References

Fig 1. Educational posters used on cannulation trolleys and throughout the Emergency Department

Fig 2. Graphs showing reductions in haemolysis over time. The percentage of biochemistry samples that were haemolysed such that serum potassium (K+) or Troponin could not be interpreted is depicted, showing weekly data and a 4-weekly moving average. Results are categorised according to location (ED, Emergency Department; MAU, Medical Admissions Unit; and Rest of the Hospital).

Fig 3. Graph showing the projected cost savings in assays and equipment based on the reduction in haemolysis achieved.