

# 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.<sup>1</sup>

Haemolysed samples cost time and money<sup>2</sup>:

- 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 outlining recommended changes to reduce haemolysis.<sup>3,4</sup>
- 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 Jun-Aug 2013: haemolysis of urea and electrolytes (U&Es) 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 1<sup>st</sup>, 2013 to Jul 31<sup>st</sup>, 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 U&E / LFTs and 100% of Troponins are repeated.

**Do haemolysed blood samples**

- ☑ Drive you mad?
- ☑ Cause patient delays?
- ☑ Make more work for everyone?

**TODAY in our Department**

- >1 in 5 patients have haemolysed U&Es and LFTs (that's 20-30 samples)
- 3/10 clotting samples are haemolysed
- 3/10 troponin T samples are haemolysed

**3 STEPS to REDUCE HAEMOLYSIS**  
to make for a happier you, a happier patient, and happier colleagues!

- ♦ **Take bloods through a 21G needle**  
Reduces haemolysis by 84%  
If using a large cannula (green or larger), use gentle syringe aspiration and a transfer device
- ♦ **Use the antecubital fossa whenever possible**  
Reduces haemolysis by 55%
- ♦ **Remember the draw order: B-CSF**  
Blood culture (or **BIN** the first tube if no cultures)  
Clotting  
Serum  
FBC

Think twice! It won't save time taking blood from a veniflon if the bloods have to be repeated ....

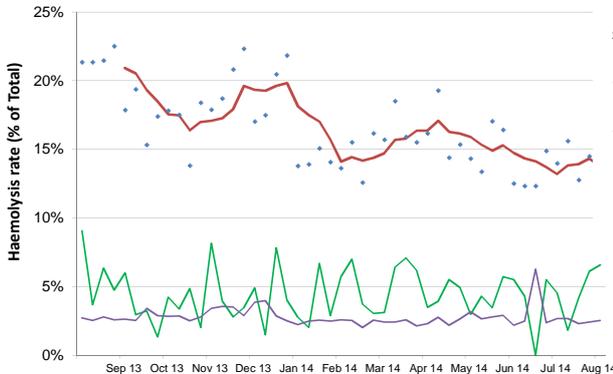
**<5% haemolysis is achievable!**

References: Farber 1986; Burns, E. R. and N. Yoshikawa (2002). Hemolysis in serum samples drawn by emergency department personnel versus laboratory phlebotomists. Lab Med 33: 378-380. Heyer, N. J., J. H. Derzon, L. Wings, C. Shaw, D. Mass, S. R. Snyder, P. Epner, J. H. Nichols, J. A. Gayken, D. Ernst and E. B. Liebow (2012). Effectiveness of practices to reduce blood sample hemolysis in EDs: a laboratory medicine best practices systematic review and meta-analysis. Clin Biochem 45(13-14): 1012-1032.

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

## Results

### Haemolysis of K+ (as % of Total samples analysed)



### Haemolysis of Troponin samples

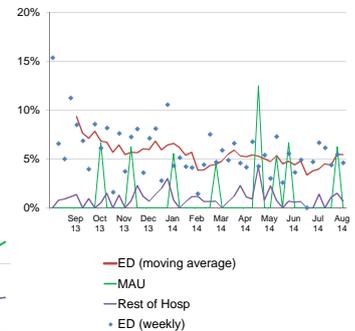


Fig 2. Graphs showing reductions in haemolysis over time. The percentage of biochemistry samples that were haemolysed such that serum potassium (K+) or Troponin could not be interpreted is depicted, showing weekly data and a 4 weekly moving average. Results are categorised according to location (ED,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

### Haemolysis Significantly Reduced

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

**Sep 13:** 21.7% (136/627 samples in 1 wk)  
**Aug 14:** 11.8% (80/678 samples in 1 wk)

Relative risk (RR) of haemolysis (Aug 14, compared to baseline data):

**0.54 (adj R<sup>2</sup> = 0.45, p<0.0001)**

- LFT haemolysis also fell significantly from 22.9 to 10.8% (RR 0.47; adj R<sup>2</sup> = 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.

### Annual Costs of Haemolysis Before and After Quality Improvement Project

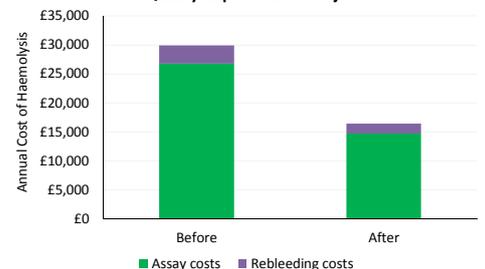


Fig 3. Graph showing the projected cost savings in assays and equipment based on the reduction in haemolysis achieved.

### 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.



Fig 2. BD blood transfer device

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

Table 1. Assay / rebleeding costs of haemolysis

Component	Value per month	Value per year
Cost of repeating assays based on SLR	£2,233	£26,801
Cost of equipment to rebleed: (butterfly, needle and vacutainer)	£260.82	£3,129.84
<b>TOTAL COSTS</b>	<b>£2,494</b>	<b>£26,801</b>

SLR – service level agreement. Staff time and delays to discharge were not included in cost estimation.

## 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

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