Audit of Extreme Hyperkalaemia at St Thomas' Hospital

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Introduction

Hyperkalaemia has the potential to cause patient harm; the most significant clinical risk in severe hyperkalaemia being cardiac arrest. The most common causes of hyperkalaemia are renal failure, acidosis, medications (e.g. ACE-inhibitors) and mineralocorticoid deficiency. It is essential to be able to promptly and correctly identify hyperkalaemia.

There are a number of pre-analytical factors which can affect potassium measurement, including haemolysis, delayed separation of serum, and K-EDTA contamination. These causes of "pseudohyperkalaemia" must be ruled out prior to reporting a high potassium result.

Current laboratory practice is that all potassium results >5.90 mmol/L are automatically repeated via the analyser rerun function. A calcium measurement is automatically reflexed when a potassium result is >7.50 mmol/L – to check for EDTA contamination.

The aim of this audit was to assess the clinical appropriateness of reporting of very high (>7.00 mmol/L) potassium results by the Viapath Automated Chemistry laboratory at St Thomas' Hospital.

Methods

All potassium results generated by the Roche analysers at St Thomas' Hospital between 06/09/16 and 19/09/16 were individually examined looking at:

- Whether or not a numerical result was reported
- If a result was not reported, what comment or reason was given for not reporting a numerical result.
- The clinical appropriateness of the reported numerical result (through examining previous results, clinical history and accompanying blood test results, particularly the rest of the renal profile

Results (1)

During the 2 week examination period, 112 potassium results >7.00 mmol/L were generated by the Roche analysers at St Thomas' Hospital, of which 23 numerical results (20.5%) were reported (Figure 1).

The range of potassium results measured was 7.01 – 30.77 mmol/L.

Of the 23 reported numerical results, the range was 7.01 – 9.29 mmol/L.

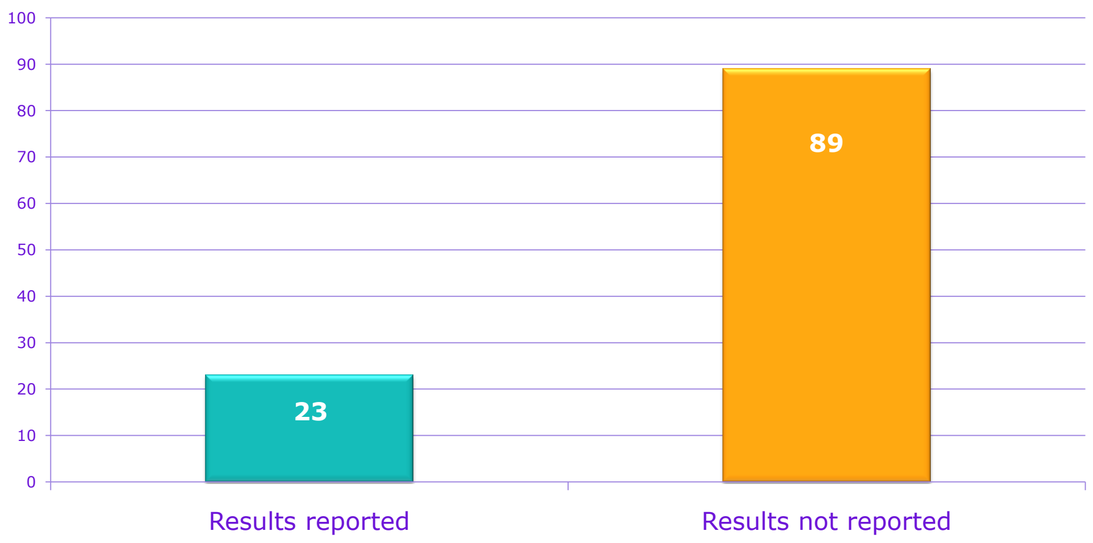

Figure 1 – High potassium results (>7.00 mmol/L) generated at St Thomas' Hospital between 06/09/16 to 19/06/16 (n=112). Proportion of numerical potassium results reported and those not reported.

Results (2)

All 23 patient samples where a numerical result was reported were deemed appropriate upon clinical review.

- The majority (n=21) of these very high potassium results were due to renal failure, including AKI and dialysis patients.
- There was one patient with a high anion gap metabolic acidosis.
- There was one GP patient where no sample date was given, with a potassium result of 7.3 mmol/L and a creatinine of 145 µmol/L. The result was phoned to the clinician and the following comment added: "A raised potassium may be caused by delayed transit or refrigeration of the sample before it reaches the laboratory. No date on sample. Results phoned 15/09/16 17:59".

Of the 89 high potassium results where a numerical result was not reported (i.e. potential pseudohyperkalaemia), reasons for non-reporting were haemolysis (n=60), delayed separation (n=15), query contamination of sample, i.e. with K-EDTA (n=13) and one sample which was insufficient to repeat an initially high result (Figure 2).

The proportion of delayed samples from Secondary and Primary Care was 53.3% and 46.7%, respectively. All but one sample that was reported as haemolysed or contaminated (98.3%) originated from Secondary Care.

No written procedure could be identified guiding laboratory scientists of the steps which should be taken to investigate pre-analytical causes of a raised potassium at technical validation.

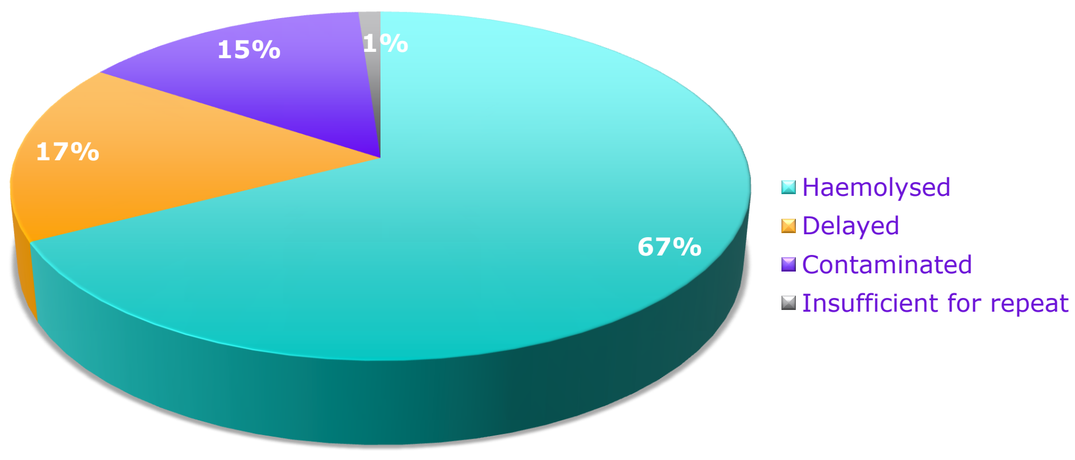

Figure 2 – High potassium results (>7.00 mmol/L) generated at St Thomas' Hospital between 06/09/16 to 19/06/16, but no numerical result reported (n=89). Reasons for non-reporting of results.

Recommendations

1. Feedback results of audit to Phlebotomy department asking them to consider performing a ward-based audit of sample collection procedures, particularly on order of draw and rates of haemolysis.
2. Contact Customer Services department and request information to be added to website regarding order of draw of blood samples.
3. Review the rerun limit for potassium as well as the potassium cut-off for reflex calcium testing.
4. Educate staff on the importance of reporting high potassium results in the absence of sufficient sample for repeat analysis.
5. Create an instruction flow-chart to guide laboratory staff on the technical validation of high potassium results

References: • Cornes M, Ford C & Gama R 2008. Spurious hyperkalaemia due to EDTA contamination: common and not always easy to identify. *Ann Clin Biochem* **45**, 601-603.