

Audit of Ethylene Glycol and Methanol Testing over a 6-Year Period

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Background

Ethylene glycol and methanol analysis are often requested in patients presenting with an unexplained metabolic acidosis, raised anion gap +/- osmolal gap, and reduced conscious level. Frequently on discussion with Toxicology services, it is advised that samples are analysed for toxic alcohols to rule out poisoning¹. Furthermore laboratory guidance stipulates that samples should be analysed within 4 hours of collection¹.

This audit will review ethylene glycol and methanol requests received by a tertiary referral laboratory over a 6-year period (2014-2019).

Aim

Review the number of requests for ethylene glycol and methanol received by a tertiary referral laboratory over a 6-year period (2014-2019).

Determine whether there is a seasonal pattern to the tests requested.

Audit the time taken for samples to reach the laboratory to determine if samples are meeting the ACB Guidelines Criteria for Toxicology Analysis¹.

Consider whether the analysis pathway could be changed to improve laboratory service.

Method

Request data was extracted and reviewed for all ethylene glycol and methanol tests requested in a tertiary referral laboratory over a 6-year period (2014-2019).

Results

NUMBER OF REQUESTS

A total of 235 ethylene glycol and 152 methanol requests were made during the audit period (2014-2019).

There were on average 39 ethylene glycol and 25 methanol requests per year.

The number of requests were viewed per month (Figure 1). The most requests were made in April (n=18) for methanol and October (n=27) for ethylene glycol.

Figures 2. and 3. summarise the number of positive samples for each analyte.

Results Continued

TIME FROM COLLECTION TO SAMPLE RECEIPT

The time from sample collection to sample receipt in the laboratory was measured (target 4 hours) for each analyte¹.

- Mean time for ethylene glycol samples was 4.5 hrs (S.D. 5.9 hrs).

- Mean time for methanol samples was 5.1 hrs (S.D. 6.6 hrs).

- 68.5% of ethylene glycol samples and 64.5% of methanol samples met the four hour target as per the ACB Guidance Paper¹. However the time for samples to be processed (approximately 1 hour) was not included.

Further analysis by collection location (Internal NHS Lothian Site versus External Laboratory Site) is summarised in Figure 4.

	ETHYLENE GLYCOL			METHANOL		
	Internal Site (NHS Lothian)	External Laboratory	Total	Internal Site (NHS Lothian)	External Laboratory	Total
Total Number of Samples	172	63	235	104	48	152
Number Meeting 4 hr target	153	8	161	95	3	98
% Meeting 4 hr target	89.0	12.7	68.5	91.3	6.3	64.5
Min (hrs)	0.1	1.8	0.1	0.1	2.2	0.1
Max (hrs)	21.2	22.2	22.2	21.2	22.2	22.2
Average (hrs)	2.1	11.1	4.5	1.9	12.2	5.1
S.D. (hrs)	3.5	5.9	5.9	3.9	5.4	6.6

Figure 4. Number of samples meeting criteria for each requesting location.

MEAN TIME FOR SAMPLES TO ACHIEVE A RESULT BELOW LIMIT OF QUANTITATION (<50 mg/L)

The mean time for samples to achieve a result below the limit of quantitation (<50 mg/L) was calculated for 88 ethylene glycol samples (from 10 patients) and 13 methanol samples (from 2 patients).

- Ethylene Glycol: 64.1 hrs (range: 11.4 - 159.3 hrs)

- Methanol: 141.1 hrs (range: 42.2 - 240.0 hrs)

TREATMENT WITH FOMEPIZOLE V. HAEMODIALYSIS

Results were reviewed to determine if there was any difference in the mean time for samples to fall below the limit of quantitation depending on the treatment type the patient received (Fomepizole versus Haemodialysis).

Only one patient was identified as having received haemodialysis in addition to fomepizole after ingesting ethylene glycol. The time for this sample to achieve a result below the limit of quantitation was 32.3 hrs (starting level 1005mg/L).

This compared to 87.4 hrs (mean starting level 550mg/L) for the samples received from patients treated with fomepizole only (n=9). The minimum time was 29.1 hrs (starting level 824mg/L) and maximum time was 159.3 hrs (starting level 1788mg/L). Baseline results for H⁺, ionised calcium, adjusted calcium and lactate were recorded (Figure 5).

Figure 5. Treatment	Baseline Results			
	H ⁺	Ionised Calcium (mmol/L)	Adjusted Calcium (mmol/L)	Lactate (mmol/L)
Fomepizole (n=9)	50.5	1.18	2.46	14.4
Fomepizole & Haemodialysis (n=1)	57.0	1.12	2.40	20.0

Hypocalcaemia (a common feature of ethylene glycol poisoning) wasn't seen in this cohort possibly due to early presentation or rapid treatment. Ethylene Glycol can cause interference with point of care method lactate results.

Conclusion

This audit will form the basis for a service review. As many requests are made out of normal working hours, ways to develop the service so that it is patient-centred yet sustainable for the future will be considered.

References

FIGURE 1. REQUESTS PER MONTH

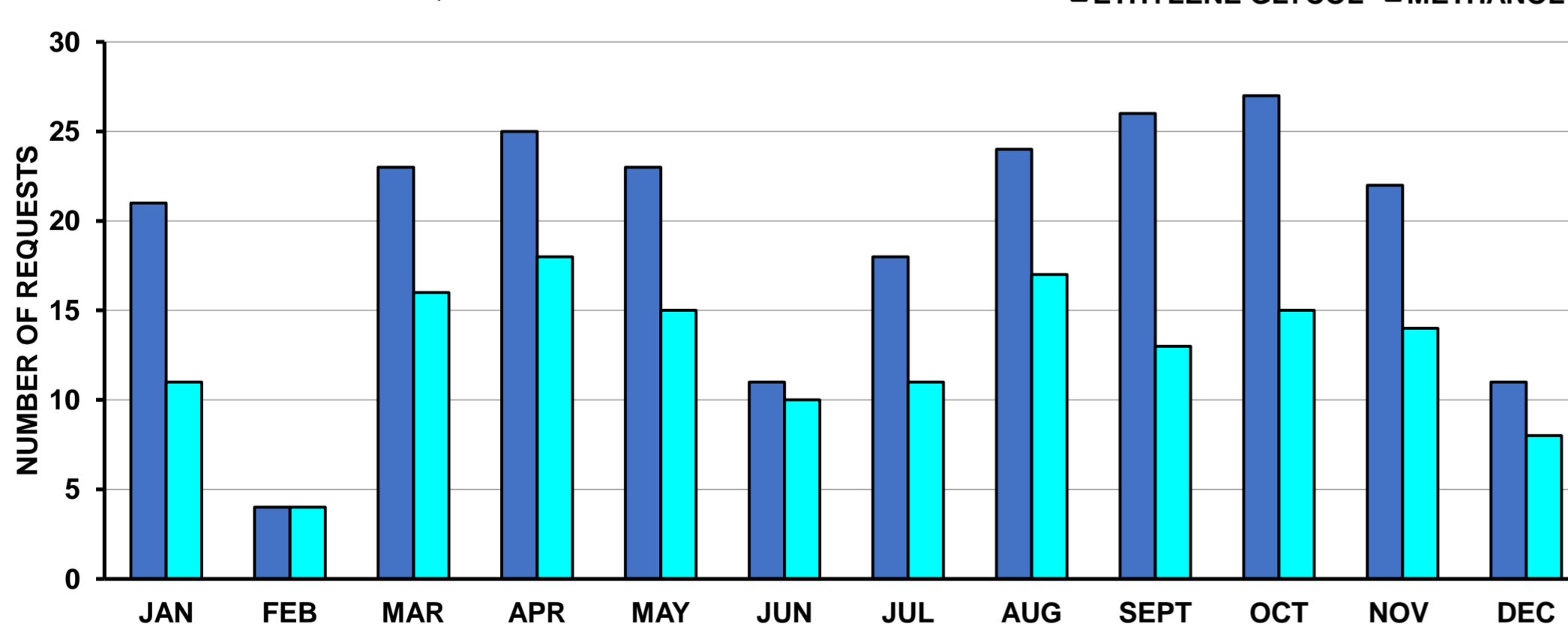


FIGURE 2. ETHYLENE GLYCOL REQUESTS

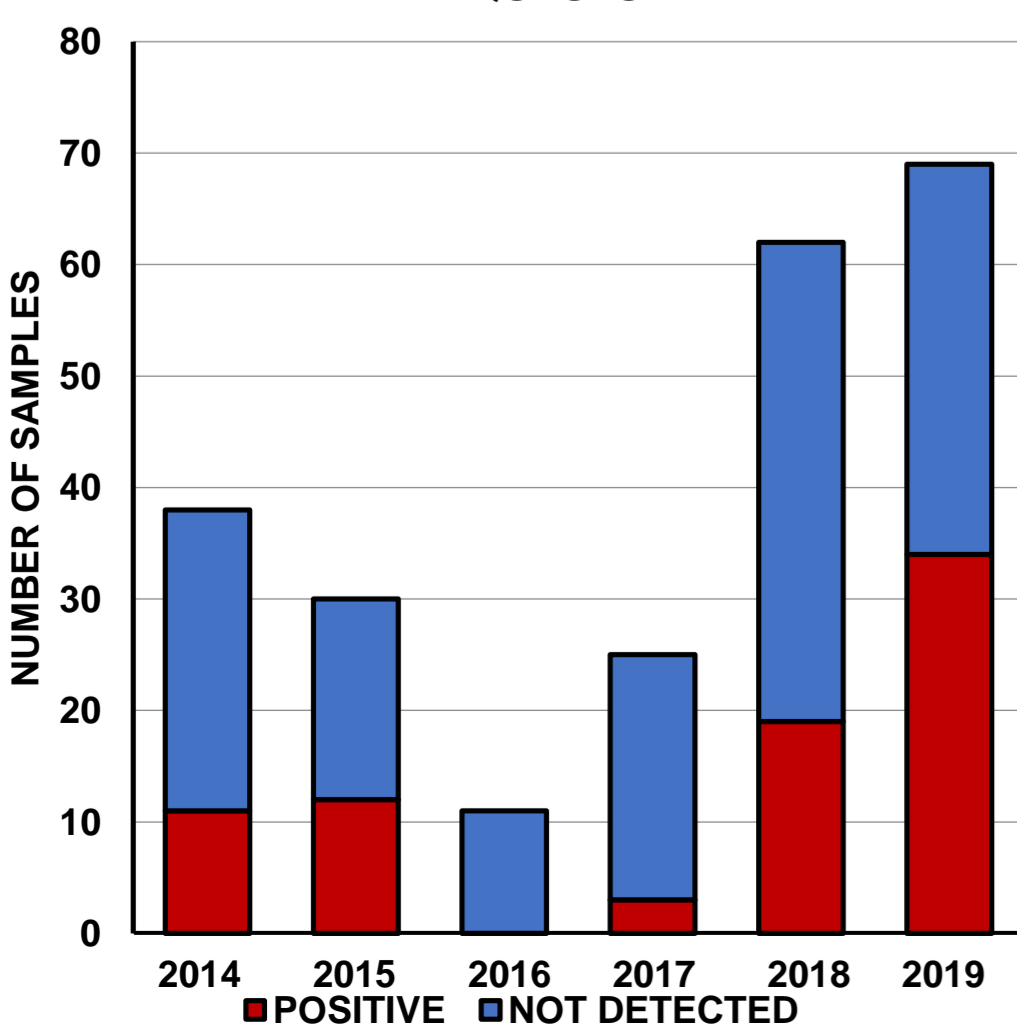


FIGURE 3. METHANOL REQUESTS

