

## AIM

- To assess adherence of Scottish laboratories to 2014 Guidelines from ACB and UK National Poisons Information Service<sup>1</sup>
- To re-audit laboratory practice in reporting common drugs / poisons (initial audit 2002)
- To review harmonisation of units, reference intervals / therapeutic ranges, telephoning limits

## STANDARDS

- Availability of investigations as recommended by the joint consensus guidelines for the investigation of patients with suspected poisoning, formulated by the UK National Poisons Information Service and the ACB and updated in 2014<sup>1</sup>.
- Documented arrangements for out of hours
- Pathology Harmony recommendations for units & Therapeutic target ranges<sup>2</sup>
- Royal College of Pathologists recommendations for communication of critical results<sup>3</sup>
- Awareness of assay limitations

## METHOD

- A questionnaire was sent to Clinical Lead and Audit Group representatives for each Health Board
- Replies were received from 11 out of 14 Health Boards

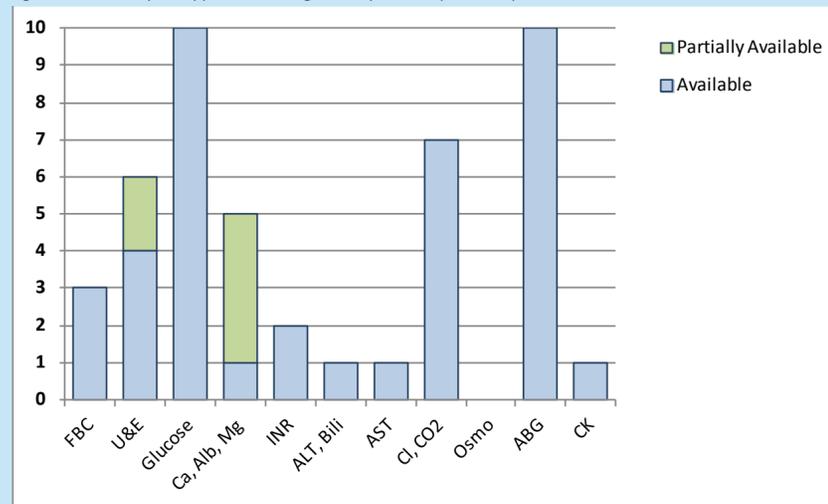
## RESULTS

### Supportive Investigations

All 11 responding Health Boards are able to offer the following supportive investigations 24/7 with a turnaround time <2 hours, from the laboratory and/or via POCT:

- FBC, INR
- Sodium, potassium, urea, creatinine
- Glucose
- Arterial blood gases
- Anion gap (chloride & bicarbonate), osmolality & osmolar gap
- Calcium, albumin, magnesium
- Transaminases, bilirubin, creatine kinase

Figure 1: Availability of supportive investigations by POCT. A partial response indicates Na+, K+, Ca2+ are available



### Assays requiring 24 hour availability

The following tests should be available 24/7 with turnaround time < 2 hours:

- COHb, methaemoglobin
- Paracetamol, salicylate, ethanol,
- Digoxin, lithium, theophylline, valproate, iron

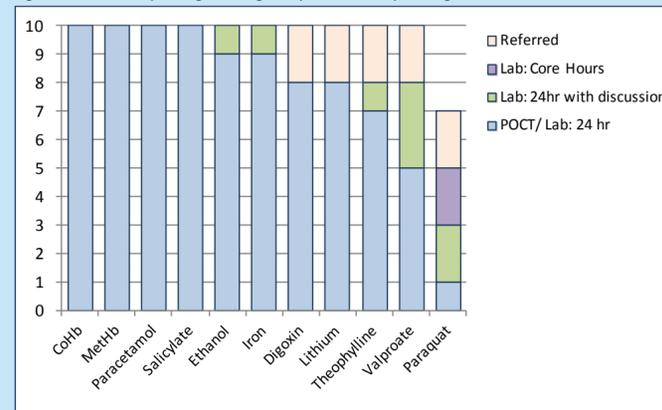
Most of the responding Health Boards are able to provide these tests urgently 24/7.

Some require prior contact with the lab for urgent processing.

2 Health Boards refer requests for digoxin, lithium, theophylline & valproate.

Qualitative urine paraquat analysis is not universally available.

Figure 2: Availability of urgent drug analyses in 10 responding Health Boards



### Assays which should be available within 24 hours, if required

The following tests may not be available in every acute hospital but arrangements for urgent analysis should be possible if required:

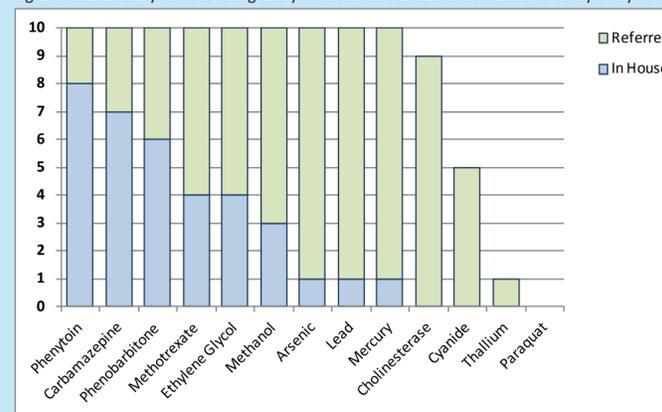
- Phenobarbital, phenytoin, carbamazepine
- Methotrexate
- Ethylene glycol, methanol
- Thyroxine
- Arsenic, lead, mercury
- Cholinesterase
- Cyanide, thallium
- Toxicology screen

All of the responding Health Boards are able to offer Phenytoin, Carbamazepine, Phenobarbitone, methotrexate, ethylene glycol, methanol either locally or by referral, with urgent arrangements possible if required. All Health Boards refer arsenic, lead & mercury requests to STEMDRL (Glasgow) where urgent analysis can be arranged. All Health Boards refer cholinesterase to Southmead, Bristol (no Scottish service available).

There was uncertainty in the responses about the availability of cyanide & thallium.

No quantitative plasma paraquat analysis is available.

Figure 3: Availability of other drug analyses from a Health Board's own laboratory or by referral



### Reporting Units

In contrast to the findings of the previous Scottish audit in 2002, reporting units for drugs are consistent across all Health Boards.

As described in the joint ACB/NPIS guideline (2002) and the recommendations of a Consensus meeting in 2006<sup>4</sup>, all drugs are reported in mg/L except:

- % for COHb & MetHb
- ug/L for digoxin
- umol/L for methotrexate, lead, iron
- nmol/L for mercury
- nmol/mmol creatinine for (urine) arsenic
- U/L for cholinesterase
- mg/dL for ethanol (1 Health Board also reports mmol/L)

### Reference Intervals / Therapeutic ranges

There is significant variation in the reference intervals/therapeutic ranges quoted by laboratories (e.g. 10 different ranges for iron).

Most Health Boards use Pathology Harmony ranges<sup>2</sup> for carbamazepine, lithium and theophylline.

	Pathology Harmony	Number of HBs	Variations
Carbamazepine	4 – 12 mg/L	5	4 – 10
Phenobarbitone	10 – 40 mg/L	2	15 – 40 (3) <40 (1)
Phenytoin	5 – 20 mg/L	3	10 – 20 (4)
Lithium	0.4 – 1.0 mmol/L	6*	0.5 – 1.0 (1) *0.4 – 0.8 if >65y
Digoxin	0.5 – 1.0 ug/L	1	0.5 – 2.0 (4) 0.8 – 2.0 (1) 1.0 – 2.0 (1)
Theophylline	10 – 20 mg/L	8*	*5 – 10 if <4y

### Telephone limits

Responses demonstrate variations in practice with regards to urgent communication of critical results.

	RCPATH recommendations <sup>3</sup>	Number of HBs	Variations
Digoxin	>2.5 ug/L	5	>2.0
Theophylline	>25 mg/L	6*	*>10 neonates; >35; >45 adults, >10 neonates
Phenytoin	>25 mg/L	4	>23; >30; >40
Lithium	>1.5 mmol/L	6	>1.2; >1.0
Ethanol	>400 mg/dL (?lower for paed)	0	All (2); All paed; >300
Paracetamol	All detectable (or agreement with A&E)	4*	*>50 for adults in A&E; All (2); >100
Salicylate	>300 mg/L	3	All (2); >70; >350; >500

### Potential Assay Interference

Laboratories were asked about their awareness of, and existence of policies for:

- Digoxin measurement in patients receiving digoxin-specific antibodies (Digibind)
- Interference by haemolysis in iron assays
- Iron measurement in patients on desferrioxamine
- Interference by NAC/NAPQI in enzymatic creatinine assays

Not all labs indicated that they had policies for reporting results and advising users in these circumstances.

## RECOMMENDATIONS

- Laboratories should review current gaps in provision: paraquat (urine & plasma), cyanide, thallium
- Laboratories should review variation in reference intervals / therapeutic ranges, and consider adoption of Pathology Harmony ranges if appropriate
- Laboratories should review telephoning practice with reference to Royal College of Pathologists guidelines
- Laboratories should be aware of assay interferences and be able to provide interpretative advice to users