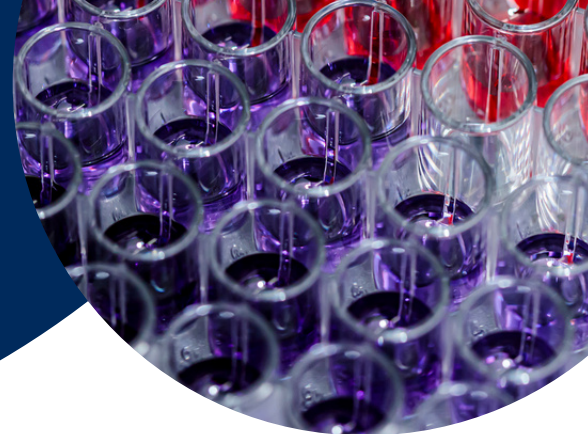


Biochemistry and Haematology Critical Values Policies Across the GTA

LMP Quality Council Review Findings



June 2022

This document summarizes our survey findings for policies and thresholds relating to critical values from hospitals within the Greater Toronto Area. This initial assessment into current critical values practices and thresholds will serve as a foundation for consensus recommendations related to critical values for clinical laboratories.

Laboratories Policies Survey: key findings

All surveyed institutions follow a similar framework with regards to critical values policies:

- There is a defined list of tests that warrant having critical value(s) in place in consultation with clinical stakeholders
- Critical results are primarily flagged/identified by the Laboratory Information System (LIS)
- Laboratory staff are primarily responsible for immediate communication of critical values
- The minimum information to be communicated to clinical staff includes test name, test result and patient name, all of which must be read back to laboratory staff
- There is documentation of critical value communication primarily within the LIS

There is opportunity for improvement with respect to auditing and quality management for critical values systems across all institutions

- The frequency and stakeholders involved with periodic audits of critical values is not well-defined across institutions
- Few laboratories monitor quality indicators/measures such as:
 - Time elapsed between identification and receipt of critical results
 - Critical results flagging rates

Critical Values Survey: key findings

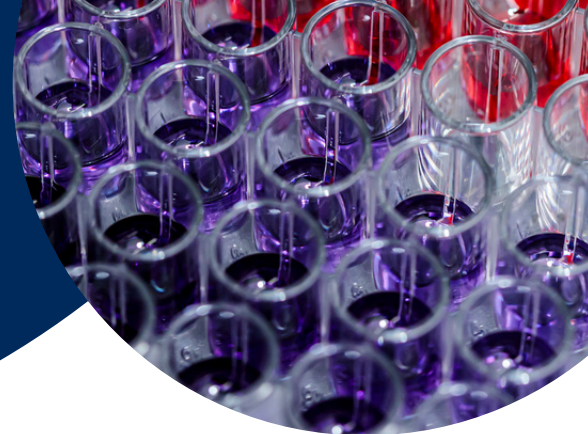
Across 16 participating institutions, we identified a total of 93 tests within Biochemistry and Haematology/Coagulation with critical values - see page 7.

Of note, there was considerable variability for population-specific critical values across institutions.

- Characteristics used to define a specific population included: sample type, age, inpatient/outpatient status, anticoagulant status

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The following tests are likely to be “harmonizable” with respect to critical values within the GTA as they displayed the least variability across institutions:

Low Critical Value	High Critical Value
pCO ₂	pCO ₂
pO ₂	Bicarbonate
Glucose	Calcium, total
Magnesium	Calcium, ionized
Osmolality	Osmolality
Sodium	Phosphate
Fibrinogen	Hemoglobin
Neutrophils	INR
	Platelets
	Gentamicin, pre-dose
	Phenobarbital
	Theophylline
	Tobramycin, pre-dose
	Vancomycin, pre-dose

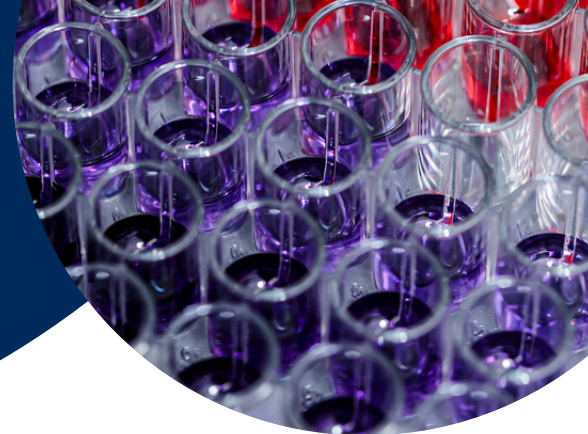
Summary and recommendations

This initial assessment into current critical values practices and thresholds has identified commonalities and differences across GTA hospitals. Although it is premature to provide recommendations on the “appropriate” critical values policies, these findings will serve as a foundation for subsequent consensus building with key stakeholders.

The ultimate goal will be to develop and disseminate standardized critical values policies wherever appropriate and possible for the GTA.

Biochemistry and Haematology Critical Values Policies Across the GTA

LMP Quality Council Review Findings



June 2022

Blood Gas/Critical Care

See page 7 for a one-page summary

Test	Low		High	
	N*	Range (min - max)	N*	Range (min - max)
pH	31	7.00 - 7.26	31	7.50 - 7.99
pCO ₂ (mmHg)	19	20 - 31	19	50 - 70
pO ₂ (mmHg)	17	20 - 61	3	90 - 95
Bicarbonate (mmol/L)	18	10 - 16	14	35 - 40
Calcium, total (mmol/L)	20	1.40 - 2.00	20	2.99 - 3.50
Calcium, ionized (mmol/L)	10	0.60 - 1.00	9	1.50 - 1.70
Glucose (mmol/L)	32	2.2 - 3.0	39	16.7 - 30.0
Lactate (mmol/L)	<3	N/A	14	2.4 - 5.6
Magnesium (mmol/L)	16	0.30 - 0.50	14	1.20 - 6.05
Osmolality (mOsm/kg)	7	250 - 251	8	320 - 349
Phosphate (mmol/L)	9	0.30 - 0.70	4	2.99 - 3.49
Potassium (mmol/L)	30	2.5 - 3.1	30	5.5 - 6.6
Sodium (mmol/L)	16	120 - 125	16	150 - 160

Legend

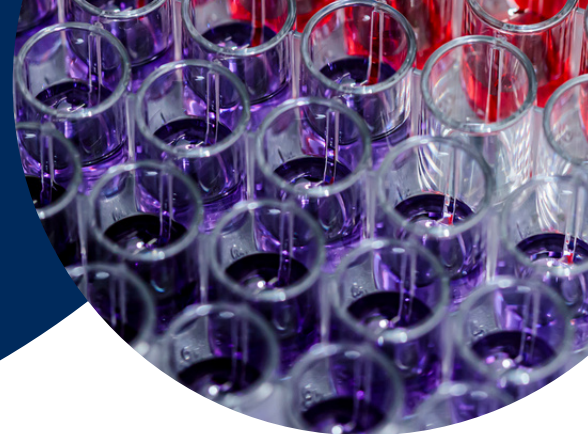
Considered harmonizable (see page 2)

Not considered harmonizable

* If any institution reported more than one critical low/high value for a test in question, each one was counted as one critical value. For example, an institution reporting separate potassium critical high values for pediatrics and adults would have N=2.

Biochemistry and Haematology Critical Values Policies Across the GTA

LMP Quality Council Review Findings



June 2022

Critical Values Survey Summary Table

General Chemistry

See page 7 for a one-page summary

Test	Low		High	
	N*	Range (min - max)	N*	Range (min - max)
Ammonia (µmol/L)	<3	N/A	7	98 - 300
Bilirubin, total (µmol/L)	<3	N/A	39	140 - 350
Creatinine (µmol/L)	<3	N/A	13	300 - 600
Iron (µmol/L)	<3	N/A	3	50 - 55
Troponin-I (µg/L)	<3	N/A	3	0.40 - 0.50
Urate (µmol/L)	<3	N/A	6	700 - 1200

Hematology/Coagulation

Test	Low		High	
	N*	Range (min - max)	N*	Range (min - max)
aPTT (s)	<3	N/A	21	75 - 150
Fibrinogen (g/L)	12	0.3 - 1.1	<3	N/A
Hemoglobin (g/L)	29	50 - 80	23	200 - 200
INR	<3	N/A	17	4 - 6
Leukocytes (x10 ⁹ /L)	18	0.5 - 2.5	20	20 - 100
Neutrophils (x10 ⁹ /L)	12	0.5 - 1.1	<3	N/A
Platelets (x10 ⁹ /L)	21	20 - 101	14	1000 - 1000

Legend

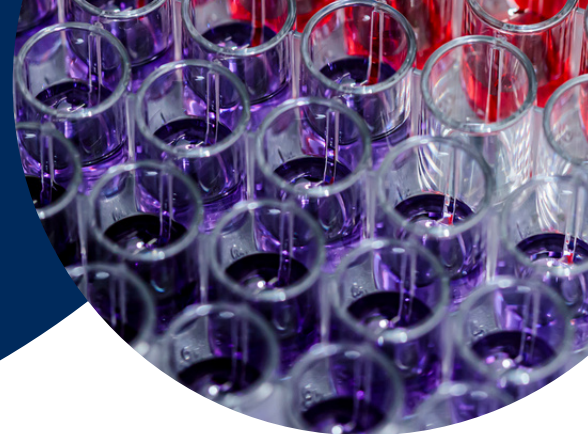
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Biochemistry and Haematology Critical Values Policies Across the GTA

LMP Quality Council Review Findings



June 2022

Critical Values Survey Summary Table

Drugs/Toxicology

See page 7 for a one-page summary

Test	Low		High	
	N*	Range (min - max)	N*	Range (min - max)
Acetaminophen (µmol/L)	<3	N/A	21	199 - 800
Amikacin (mg/L)	<3	N/A	<3	N/A
Carbamazepine (µmol/L)	<3	N/A	14	50 – 85
Digoxin (nmol/L)	<3	N/A	16	2.6 – 4.0
Ethanol (mmol/L)	<3	N/A	8	22 – 50
Gentamicin (pre-dose) (mg/L)	<3	N/A	7	1.8 – 5.0
Gentamicin (post-dose) (mg/L)	<3	N/A	9	8 – 20
Lithium (mmol/L)	<3	N/A	15	1.0 – 2.0
Phenobarbital (µmol/L)	<3	N/A	7	170 – 225
Phenytoin (µmol/L)	<3	N/A	16	55 – 120
Salicylate (mmol/L)	<3	N/A	20	2.0 – 4.0
Theophylline (µmol/L)	<3	N/A	8	109 – 140
Tobramycin (pre-dose) (mg/L)	<3	N/A	4	1.8 – 2.0
Tobramycin (post-dose or random) (mg/L)	<3	N/A	5	8 – 19
Valproate (µmol/L)	<3	N/A	15	693 – 1400
Vancomycin (pre-dose) (mg/L)	<3	N/A	10	20 – 80
Vancomycin (post-dose) (mg/L)	<3	N/A	13	50 - 80

Legend

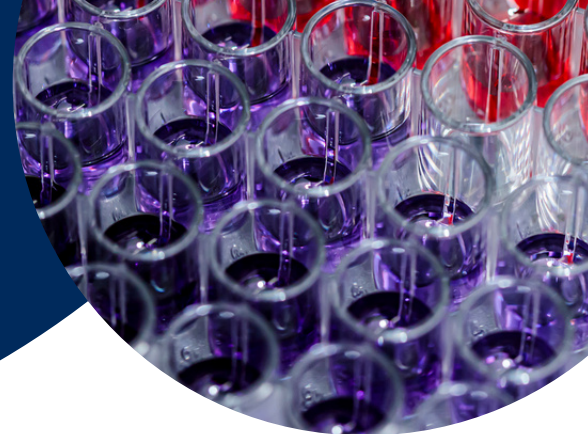
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Biochemistry and Haematology Critical Values Policies Across the GTA

LMP Quality Council Review Findings



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This document was developed by the [Clinical Laboratory Quality Indicators and harmonization across the GTA hospitals](#) Working Group of the [Quality Council](#), Department of Laboratory Medicine and Pathobiology, University of Toronto.

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