

TEST	UNITS	Critical Low (Rapid response)	Abnormal Low (Clinical review)	Reference interval	Abnormal High (Clinical review)	Critical High (Rapid response)
ARTERIAL BLOOD GAS						
pH		≤7.20	7.21-7.34	7.35 - 7.45	7.46-7.59	≥7.60
pCO ₂	mmHg	≤20	21-34	35 - 45	46-69	≥70
pO ₂	mmHg	≤40	41-74	75 - 105		
CarboxyHb	%			0.3 - 1.8	1.9-9.9	≥10
MetHb	%			0.4 - 1.2	1.3-9.9	≥10.0
Bicarbonate	mmol/L	≤10	11.0-21.0	22 - 28	29-39	≥40
Base Excess	mmol/L	≤-5	-2.9 to -4.9	-3 to +3		
Lactate	mmol/L			<2.0	2.0-3.9	≥4.0
Sodium	mmol/L	≤120	121-135	136 - 146	147-154	≥155
Potassium	mmol/L	≤2.5	2.6-3.6	3.7 - 4.7	4.8-5.9	≥6.0
Chloride	mmol/L			101 - 110		
Anion Gap	mmol/L			8.0-16.0		
Ionized Calcium	mmol/L	≤0.80	0.81-1.14	1.15 - 1.30	1.31-1.59	≥1.60
Urea	mmol/L			3.0 - 8.0	8.1-29.9	≥30
Creatinine (Male)	umol/L			60 - 110	111-399	≥400
Creatinine (Female)	umol/L			45 - 90	91-399	≥400
Glucose (Fasting)	mmol/L	≤2.5	2.6-3.4	3.5 - 5.4	5.5-24.9	≥25
Haemoglobin (Male)	g/L	≤70	71-129	130 - 170	171-199	≥200
Haemoglobin (Female)	g/L	≤70	71-119	120 - 150	151-179	≥180
Haematocrit (Male)	L/L	<0.20	0.21-0.39	0.40 - 0.50	0.51-0.59	≥0.6
Haematocrit (Female)	L/L	<0.20	0.21-0.35	0.36 - 0.46	0.47-0.59	≥0.6
OTHER POCT (ARTERIAL)						
cTroponin-I (i-STAT)	ug/L			≤0.08		≥0.09
cTroponin-I (AQT-90)	ng/L			≤23.0		≥24
cTroponin-T (AQT-90)	ng/L			≤17.0		≥18
BNP (i-STAT)	ng/L			≤50		≥51
INR	INR			2.0 - 3.5	3.6-3.9	≥4.0

TEST	UNITS	Critical Low (Rapid response)	Abnormal Low (Clinical review)	Reference interval	Abnormal High (Clinical review)	Critical High (Rapid response)
VENOUS BLOOD GAS						
pH		≤7.20	7.21 - 7.29	7.30 - 7.40	7.41-7.59	≥7.60
pCO ₂	mmHg	≤20	21 – 39	40 - 50	51-69	≥70
pO ₂	mmHg			No range		
CarboxyHb	%			0.3 - 1.8	1.9-9.9	≥10
MetHb	%			0.4 - 1.2	1.3-9.9	≥10.0
Bicarbonate	mmol/L	≤10	11.0-21.0	22 - 32	33-39	≥40
Base Excess	mmol/L	≤-5	-2.9 to -4.9	-3 to +3		
Lactate	mmol/L			<2.0	2.0-3.9	≥4.0
Sodium	mmol/L	≤120	121-135	136 - 146	147-154	≥155
Potassium	mmol/L	≤2.5	2.6-3.6	3.7 - 4.7	4.8-5.9	≥6.0
Chloride	mmol/L			101 - 110		
Anion Gap	mmol/L			8 - 16		
Ionized Calcium	mmol/L	≤0.80	0.81-1.14	1.15 - 1.30	1.31-1.59	≥1.60
Urea	mmol/L			3.0 - 8.0	8.1-29.9	≥30
Creatinine (Male)	umol/L			60 - 110	111-399	≥400
Creatinine (Female)	umol/L			45 - 90	91-399	≥400
Glucose (Fasting)	mmol/L	≤2.5	2.6-3.4	3.5 - 5.4	5.5-24.9	≥25
Haemoglobin (Male)	g/L	≤70	71-129	130 - 170	171-199	≥200
Haemoglobin (Female)	g/L	≤70	71-119	120 - 150	151-179	≥180
Haematocrit (Male)	L/L	<0.20	0.21-0.39	0.40 - 0.50	0.51-0.59	≥0.6
Haematocrit (Female)	L/L	<0.20	0.21-0.35	0.36 - 0.46	0.47-0.59	≥0.6
OTHER POCT (VENOUS)						
cTroponin-I (i-STAT)	ug/L			≤0.08		≥0.09
cTroponin-I (AQT-90)	ng/L			≤23		≥24
cTroponin-T (AQT-90)	ng/L			≤17		≥18
BNP (i-STAT)	ng/L			≤50		≥51
INR	INR			2.0 - 3.5	3.6-3.9	≥4.0

Comments/Notes

1. Reference interval (**white background**) indicates the expected range of test values for 95% of a healthy population.
 - The arterial blood gas reference intervals (RI) are based on a survey of NSWHP laboratories and on manufacturers' recommendations and represent the consensus of NSWHP Chemical Pathology Stream.
 - The venous blood gas reference intervals have been determined by a study on n=216 healthy adult volunteers using Radiometer ABL 800 series Blood Gas Analysers - Refer to POW summary document dated 23 August 2017. Transferability of these intervals will need to be established when applying to other devices.
 - The reference intervals listed above apply to adults. They have not been validated for children or neonates.
2. Abnormal intervals/clinical review (**yellow background**) signify pathological changes with a concentration dependent graded risk of significant adverse outcomes. These results require clinical review within a clinically appropriate time frame to ensure appropriate clinical action and to prevent patient harm.
3. Critical risk thresholds/rapid response (**red background**) signify results that represent immediate risk of major adverse outcomes to patients. These results must be immediately notified to the treating clinician in order to ensure urgent clinical evaluation and medical intervention.
4. Critical risk thresholds are based on a systematic survey of the literature [8] and a 2017 survey of NSWH clinicians.
5. Association of clinical symptoms with Methaemoglobinaemia:

3-15%	slate grey skin discoloration
20%	cyanosis or asphyxia
25-50%	headache, lightheaded, weak, chest pain, confusion
50- 70%	dysrhythmia, delirium, seizure, lactic acidosis, coma
>70%	arrhythmia and death
6. References and source information are available from NSW Health Pathology, controlled document NSWHP-POCT-INFO-0064.
7. NSW Health Pathology would like to acknowledge the following
 - a. Rita Horvath as the initiator and coordinator and supervisor of the project
 - b. Kirsty Ress who coordinated and designed the whole venous blood gas reference interval study, collected all the samples with a small team in the Prince of Wales Hospital laboratory, did a systematic review of ABG-VBG

- differences, analysed all the data and came up with all summary reports and documents to support our stream's final decision making
- c. Dorra Arvanitis who collected flagging rate information and analysing the adaptability of reference intervals to local populations
 - d. Tony Diamond, who provided scientific analysis and interpretation on the vast amount of data
 - e. Doug Chesher who provided flagging rate data on tens of thousands of patients to again check the transferability of these reference intervals to NSW Health patient population
 - f. Craig Campbell who collected all the critical limits data from the literature and surveyed NSW Health clinicians' opinion
 - g. Gus Koerbin, who performed various statistical analysis to come up with the most robust reference interval data
 - h. Over 200 laboratory and health care staff from Prince of Wales Hospital, Randwick who donated their time and blood to complete this exercise.
 - i. Members of the PoCT Clinical Advisory Committee, Chemical Pathology (under the direction of Margaret Janu) Clinical and Haematology Streams for reviewing the reference intervals
 - j. Mel Press for her suggestion to incorporate reference intervals into the “Between the Flags” format used by clinicians