

Analyte (measured in serum, plasma or whole blood unless otherwise stated)	Units	Reference range / Target range / Cut-off value / Comment	Source of reference range	Section
25OH Vitamin D	nmol/L	<25 nmol/L - deficient 25-49 nmol/L - insufficient 50-99 nmol/L - sufficient 100-250 nmol/L - advise review vitamin D intake >250 nmol/L - suggests vitamin D toxicity	Expert opinion and in-line with NICE and Adult Endocrine team guidelines. Implemented Nov 2020.	LGI Biochem
Adrenocorticotrophic hormone (ACTH)	ng/L	<47	Siemens Immulite IFU stated range (Rev.17 2015).	LGI Biochem
Alanine amino-transferase (ALT)	U/L	<26 wk <55 27 wk - 4 yr <60 4 wk - 12 yr <50 12 - 14 yr F: <45, M: <70 14 - 16 yr F: <45, M: <60 16 - 19 yr F: <45, M: <55 >19 yr <40	Siemens IFU stated range based on Tietz Clinical Guide to Laboratory Tests, 4th ed. 2000.	Biochem (cross-site)
Albumin	g/L	<1 yr 30 - 45 1 - 17 yr 30 - 50 >17 yr 35 - 50	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Albumin (CSF)		No normal range	NA	Biochem (cross-site)
Albumin (fluid)		No normal range	NA	Biochem (cross-site)
Albumin (Urine)	mg/L	No normal range	NA	Biochem (cross-site)
Albumin:Creatinine Ratio (Urine)	mg Alb/mmol Creat	Urine Albumin Creatinine Ratio (mg Alb/mmol creat): Female 0-3.5; Male 0-2.5	NICE Guideline on the management of type 2 diabetes 2008 (CG87)	Biochem (cross-site)
Alkaline Phosphatase (ALP)	U/L	<u>Age</u> <14 days 82-249 15 days to 1 yr 122-473 1 to 10 yrs 142-336 10 to 13 yrs 128-420 13 to 15 yrs 55-255 15 to 17 yrs 19-116 17 to 18 yrs 43-86 Adult 30 - 130	ALP changes quite markedly throughout life with peaks in childhood and puberty (and pregnancy). Harmony ranges implemented Feb 2016. For patients ages 0-18yrs the CALIPER reference ranges have been adopted (Feb 2016).	Biochem (cross-site)
Alpha fetoprotein (AFP) (serum)	kU/L	<7	Siemens IFU stated range for Centaur XP implemented 2008 with confirmation of assay comparability via V&V for XPT in 2016 and Atellica in 2019	Biochem (cross-site)
Ammonia	umol/L	pre-term / sick neonate <150 term <5 wk <100 >5 wk <50	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)

Amylase	U/L	<110	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Amylase (fluid)	U/L	No normal range	NA	Biochem (cross-site)
Angiotensin converting enzyme (ACE)	U/L	20-70	Manufacturer stated ranges implemented Feb 2016 - ACE Buhlman IFU (Rev 2012)	LGI Biochem
Activated partial thromboplastin time (APTT) (Synthesil)	s	23.5 - 37.5	Locally determined - validation of original TOP 2006 re-checked and amended 2012	Haematology (cross-site)
Aspartate aminotransferase (AST)	U/L	<40	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Basophils	10 <sup>9</sup> /L	<0.1	Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Bicarbonate	mmol/L	>17 yr 22 - 29 <17 yr 19 - 28	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Bicarbonate (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Bile acids	umol/L	<14	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Bilirubin (total)	umol/L	2 - 21	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Bilirubin (total, fluid)	umol/L	No normal range	NA	Biochem (cross-site)
Bilirubin - conjugated (direct)	umol/L	<4	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Blood urea nitrogen (BUN)	mg/dL	Not reported at LHHT. BUN (mg/dL) = urea (mmol/L) x 2.8	NA	
C-reactive protein (CRP)	mg/L	<10	Siemens IFU stated range in use (XPT Rev E; Atellica Rev 01).	Biochem (cross-site)
CA 15-3	kU/L	<30	See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel recommendations	Biochem (cross-site)
CA 19-9	kU/L	<33	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
CA125	kU/L	<35	See NICE CG122 April 2012	Biochem (cross-site)
Calcium (total)	mmol/L	<5 wk >5 wk 2.00 - 2.70 2.25 - 2.60	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)

Calcium (adjusted)	mmol/L	2.20 - 2.60	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Calculated
Calcium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Calcium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Calcium:creatinine Ratio (Urine)	mmol/mmol creat	<1 yr <1.50 1 to 2 yrs <1.25 2 to 5 yrs <1.00 5 to 10 yrs <0.70 10 to 18 yrs <0.60 >18 yrs <0.45	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Calcium (24hr Urine)	mmol/day	2.50 - 7.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Carbamazepine	mg/L	4 - 12	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Carcinoembryonic antigen (CEA)	µg/L	<5	See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel Recommendations	Biochem (cross-site)
Chloride	mmol/L	95 - 108	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Chloride (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)
Chloride (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Chloride (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Cholesterol (total)	mmol/L	To interpret see published guidelines e.g. the risk tables at the rear of BNF, Q-risk online calculator.	NA	Biochem (cross-site)
Cholesterol (HDL)	mmol/L	To interpret see published guidelines e.g. the risk tables at the rear of BNF, Q-risk online calculator.	NA	Biochem (cross-site)
Cholesterol (LDL)	mmol/L	LDL cholesterol (LDL) is calculated according to the formula: LDL = Total chol - HDL - (trigs/2.29)	NA	Calculated
Cholesterol (total, fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Cortisol	nmol/L	9AM cortisol <140nmol/L: suggestive of adrenal insufficiency. 9AM cortisol 140-400nmol/L: does not exclude adrenal insufficiency. 9AM cortisol >400nmol/L: adrenal insufficiency is unlikely.	Expert clinical opinion in line with Leeds Health Pathways guidance and local evaluations of the Siemens assay (Implemented 2019)	Biochem (cross-site)
Creatine kinase (CK)	U/L	Male 40 - 320 Female 25 - 200	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Creatinine	umol/L	<15 days 27 - 81 15 d - 8 wk Clinical judgement (no data) 8 wk - 1 yr 14 - 34 1 - 3 yr 15 - 31 3 - 5 yr 23 - 37 5 - 7 yr 25 - 42 7 - 9 yr 30 - 48 9 - 11 yr 28 - 57 11 - 13 yr 37 - 63	Method change from O'Leary to enzymatic 03/10/2011 Reference: Ceriotti et al. (2008) Clin Chem 54: 559-66	Biochem (cross-site)

		13 - 15 yr >15 yr male >15 yr female	40 - 72 64 - 104 49 - 90		
Creatinine (fluid)		No normal range		NA	Biochem (cross-site)
Creatinine (urine)	mmol/L	No normal range		NA	Biochem (cross-site)
Creatinine (24hr Urine)	mmol/Day	Male	5.0-16.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
		Female	7.0-18.0		
Creatinine clearance	mL/min	Calculated parameter. No reference ranges provided.		NA	Biochem (cross-site)
DDimer Level	ng/mL	Cut off of 230 ng/mL for use as a negative predictive indicator of a VTE.		Cut-off determined by the manufacturer for the FDA.	Haematology (cross-site)
Digoxin	ug/L	0.5 - 1.0 (post-dose)		ESC guidelines for diagnosis and treatment of heart failure 2008 & Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Enhanced liver fibrosis score (ELF)	-	Calculated from HA, TIMP-1 and PIIINP results. ELF score interpretation: <7.7 = none to mild liver fibrosis 7.7 - 9.8 = moderate liver fibrosis >9.8 = severe liver fibrosis		Siemens IFU stated range for Centaur XPT and Atellica (Rev.B 2016 & Rev.01 2022).	Biochem (cross-site)
Eosinophils	x10 <sup>9</sup> /l	0.2-0.9 up to day 14 then 0.04-0.4		Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Erythrocyte sedimentation rate (ESR)	mm/hr	Male	<10	Based on NCCLS Reference and selected procedures for the ESR test (2000) and MDA Evaluation report 00050 (2000). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	LGI Haematology
		Female	<15		
Erythropoietin (EPO)	mIU/mL	3.0-18.0		Ranges derived (rounding to nearest whole number) from those described in the Beckman Access IFU (rev E).	LGI Biochem
Estimated glomerular filtration rate (eGFR)	mL/min/1.73m <sup>2</sup>	Calculated parameter, using the MDRD equation. No reference range provided; results should be interpreted on a patient-by-patient basis.		NA	Biochem (cross-site)
Ethanol	mg/dL	-		NA	Biochem (cross-site)
Ethanol (urine)	mg/dL	< 20		NA	SJUH Biochem
Factor VIII (one stage)	iU/dL	50 - 150		Locally determined before 2000	SLM (SJUH)
Factor VIII ReFacto (one stage)		ReFacto Factor VIII is a recombinant FVIII product used to treat haemophilia A patients. The assay is used to measure peaks and troughs levels of the product, so as such it has no normal range.		NA	SLM (SJUH)
Factor IX assay (one stage)	iU/dL	50 - 150		Locally determined before 2000	SLM (SJUH)

Factor XI (one stage)	iU/dL	60 - 150	Locally determined before 2000	SLM (SJUH)																		
Ferritin	ug/L	10-322	Siemens IFU stated ranges in use (combined male and female) (Cenatur XPT Rev 9; Atellica Rev 02)	Biochem (cross-site)																		
Fibrinogen (Clauss) (QFA)	g/L	1.5 - 5.8	Locally determined 2006	Haematology (cross-site)																		
Fibrinogen (derived)	g/L	1.6 - 5.9	Locally determined 2006	Haematology (cross-site)																		
Folate	ug/L	5.4 - 24.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)																		
Free T4	pmol/L	10-20	Local evaluation January 2011	Biochem (cross-site)																		
FSH	IU/L	Prepubertal children of both sexes tend to have FSH > LH and both < 2 IU/L. Females (aged 14-40) follicular and luteal phases: FSH 1 - 8 IU/L, LH 1 - 10 IU/L. Males (aged 14-40) FSH 1 - 9 IU/L, LH 1 - 9 IU/L.	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)																		
Gamma glutamyl transferase (GGT)	U/L	<table border="0"> <tr> <td><u>Age</u></td> <td><u>Male</u></td> <td><u>Female</u></td> </tr> <tr> <td>&lt;27 wk</td> <td>10 - 120</td> <td>15 - 135</td> </tr> <tr> <td>27 wk - 2 yr</td> <td>&lt;40</td> <td>&lt;40</td> </tr> <tr> <td>2 - 13 yr</td> <td>&lt;25</td> <td>&lt;25</td> </tr> <tr> <td>13 - 19 yr</td> <td>&lt;40</td> <td>&lt;25</td> </tr> <tr> <td>&gt;19 yr</td> <td>&lt;90</td> <td>&lt;50</td> </tr> </table>	<u>Age</u>	<u>Male</u>	<u>Female</u>	<27 wk	10 - 120	15 - 135	27 wk - 2 yr	<40	<40	2 - 13 yr	<25	<25	13 - 19 yr	<40	<25	>19 yr	<90	<50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
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Gentamicin	mg/L	The therapeutic range for gentamicin is variable and dependent on the regimen used (i.e. once daily or multi-dose) and the condition being treated.	NA	Biochem (cross-site)																		
Glucose (plasma)	mmol/L	fasting 3.5 - 6.0. Impaired fasting glucose: 6.1 - 6.9 mmol/L Diabetes: fasting glucose $\geq$ 7.0 mmol/L	WHO Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia, Report of a WHO/IDF consultation. WHO, Geneva, 2006	Biochem (cross-site)																		
Glucose (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)																		
Glucose (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)																		
Glucose-6-phosphate dehydrogenase (G6PD) activity	iU/g Hb	10.10 - 14.19	Sentinel diagnostics IFU stated range (Rev F57 v1.0)	Haematology (SJUH)																		
Growth hormone (GH)	ug/L	There is no set reference range for growth hormone and results should be interpreted in light of stimulation tests.	NA	LGI Biochem																		
Haemoglobin	g/L	<table border="0"> <tr> <td>&lt; 14 days</td> <td>130 - 206</td> </tr> <tr> <td>2 - 13 weeks</td> <td>95 - 140</td> </tr> <tr> <td>13 weeks - 1 yr</td> <td>105 - 140</td> </tr> <tr> <td>1 to 10 yr</td> <td>115 - 150</td> </tr> <tr> <td>10 to 16 yr</td> <td>115 - 150</td> </tr> <tr> <td>&gt; 16 yr (Female)</td> <td>115 - 160</td> </tr> <tr> <td>&gt; 16 yr (Male)</td> <td>135 - 180</td> </tr> </table>	< 14 days	130 - 206	2 - 13 weeks	95 - 140	13 weeks - 1 yr	105 - 140	1 to 10 yr	115 - 150	10 to 16 yr	115 - 150	> 16 yr (Female)	115 - 160	> 16 yr (Male)	135 - 180	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)				
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Haemoglobin A1c	mmol/mol	Diabetes is defined by an HbA1c >48 mmol/mol and optimal glycaemic control by an HbA1c <59 mmol/mol.	WHO Guidance 2011.	LGI Biochem																		

Human chorionic gonadotrophin (hCG) (serum)	U/L	<5	Local evaluation in 2012 verified assay performance against Siemens stated range of 2U/L. Subsequent evaluation in 2014 increased the functional sensitivity to 5 u/L	Biochem (cross-site)																																																															
Insulin-like growth factor 1 (IGF-1)	nmol/L	<table border="1"> <thead> <tr> <th>Age</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr><td>0-3 yrs</td><td>&lt;2.0-16.8</td><td>2.4-22.4</td></tr> <tr><td>4-6 yrs</td><td>2.9-27.0</td><td>4.6-30.2</td></tr> <tr><td>7-9 yrs</td><td>5.2-33.2</td><td>7.4-36.0</td></tr> <tr><td>10-11 yrs</td><td>8.9-41.1</td><td>15.3-58.2</td></tr> <tr><td>12-13 yrs</td><td>18.6-65.8</td><td>22.1-68.5</td></tr> <tr><td>14-15 yrs</td><td>23.0-65.9</td><td>24.8-64.5</td></tr> <tr><td>16-18 yrs</td><td>22.5-53.8</td><td>24.7-55.8</td></tr> <tr><td>19-21 yrs</td><td></td><td>15.2-42.0</td></tr> <tr><td>22-24 yrs</td><td></td><td>12.8-37.6</td></tr> <tr><td>25-29 yrs</td><td></td><td>10.9-33.7</td></tr> <tr><td>30-34 yrs</td><td></td><td>9.3-30.4</td></tr> <tr><td>35-39 yrs</td><td></td><td>8.2-29.0</td></tr> <tr><td>40-44 yrs</td><td></td><td>7.6-28.5</td></tr> <tr><td>45-49 yrs</td><td></td><td>6.9-28.0</td></tr> <tr><td>50-54 yrs</td><td></td><td>6.3-27.2</td></tr> <tr><td>55-59 yrs</td><td></td><td>5.8-27.3</td></tr> <tr><td>60-64 yrs</td><td></td><td>5.6-28.6</td></tr> <tr><td>65-69 yrs</td><td></td><td>5.2-29.3</td></tr> <tr><td>70-79 yrs</td><td></td><td>4.6-28.1</td></tr> <tr><td>80-90 yrs</td><td></td><td>4.0-27.0</td></tr> </tbody> </table>	Age	Male	Female	0-3 yrs	<2.0-16.8	2.4-22.4	4-6 yrs	2.9-27.0	4.6-30.2	7-9 yrs	5.2-33.2	7.4-36.0	10-11 yrs	8.9-41.1	15.3-58.2	12-13 yrs	18.6-65.8	22.1-68.5	14-15 yrs	23.0-65.9	24.8-64.5	16-18 yrs	22.5-53.8	24.7-55.8	19-21 yrs		15.2-42.0	22-24 yrs		12.8-37.6	25-29 yrs		10.9-33.7	30-34 yrs		9.3-30.4	35-39 yrs		8.2-29.0	40-44 yrs		7.6-28.5	45-49 yrs		6.9-28.0	50-54 yrs		6.3-27.2	55-59 yrs		5.8-27.3	60-64 yrs		5.6-28.6	65-69 yrs		5.2-29.3	70-79 yrs		4.6-28.1	80-90 yrs		4.0-27.0	Siemens revised ranges for Immulite XPI implemented as of November 2017 - see IFU (Rev.A 2016)	LGI Biochem
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International normalised ratio (INR)	-	The INR is a ratio of the prothrombin time. It is used to control warfarin therapy. Although the range for non anti-coagulated patients is 0.8 - 1.3, the range for patients that are anticoagulated varies dependant on clinical details; this is usually between 2.0 - 4.0.	NA	Haematology (cross-site)																																																															
Intrinsic factor antibodies (IFAB)	AU/mL	<table border="1"> <tbody> <tr><td>Negative</td><td>&lt;1.20</td></tr> <tr><td>Equivocal</td><td>1.2-1.52</td></tr> <tr><td>Positive</td><td>1.53</td></tr> </tbody> </table>	Negative	<1.20	Equivocal	1.2-1.52	Positive	1.53	Expected ranges as stated in Beckman Access IFU (rev J)	LGI Biochem																																																									
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Lactate	mmol/L	0.6 - 2.5	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)																																																															
Lactate (CSF)		No normal range	NA	Biochem (cross-site)																																																															
Lactate dehydrogenase (LDH)	iU/L	120-246	Siemens IFU stated ranges in use as of 2019 (Chemistry XPT Rev. G; Atellica Rev. 03 )	Biochem (cross-site)																																																															
Lactate dehydrogenase (LDH) (CSF)	iU/L	No normal range	NA	Biochem (cross-site)																																																															
Lactate dehydrogenase (LDH) (fluid)	iU/L	No normal range	NA	Biochem (cross-site)																																																															

Large unstained cells (LUC)	x10 <sup>9</sup> /L	<0.6	Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Lithium	mmol/L	0.4 - 1.0 (12 hr post-dose)	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Low molecular weight (LMW) Heparin Assay (Anti Xa)	IU/mL	Therapeutic range 0.5 - 1.2	Therapeutic ranges vary between 0.05 - 1.2 IU/mL dependant on clinical details. British society of haematology (BSH) Guidelines.	Haematology (cross-site)
Luteinising hormone (LH)	IU/L	Prepubertal children of both sexes tend to have FSH > LH and both < 2 IU/L. Females (aged 14-40) follicular and luteal phases: FSH 1 - 8 IU/L, LH 1 - 10 IU/L. Males (aged 14-40) FSH 1 - 9 IU/L, LH 1 - 9 IU/L.	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Lymphocytes	x10 <sup>9</sup> /L	0 - 2 weeks 2.0 - 16.0 2 - 13 weeks 4.0 - 12.0 14 weeks - 2 years 4.0 - 10.0 2 - 4 years 2.5 - 8.0 4 - 7 years 2.0 - 8.0 7 - 11 years 1.5 - 4.5 >11 years 1.0 - 4.5	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
Magnesium	mmol/L	<5 wk 0.6 - 1.0 >5 wk 0.7 - 1.0	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Magnesium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Magnesium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Magnesium:Creatinine ratio	mmol/mmol creat	>16 yrs 0.18-1.05	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Magnesium (24hr Urine)	mmol/Day	2.40-6.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Mean corpuscular haemoglobin (MCH)	pg	<15 days 32-39 15 days - 2 years 23-31 2 - 13 years 24-30 >13 years 27-32	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)

Mean corpuscular haemoglobin concentration (MCHC)	g/L	310 - 370	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)												
Mean corpuscular volume (MCV)	fl	<table border="0"> <tr> <td>&lt; 15 days</td> <td>100-115</td> </tr> <tr> <td>15 days - 14 weeks</td> <td>85-105</td> </tr> <tr> <td>14 weeks - 2 years</td> <td>71-90</td> </tr> <tr> <td>2 years - 5 years</td> <td>71-90</td> </tr> <tr> <td>5 years - 12 years</td> <td>77-94</td> </tr> <tr> <td>&gt; 12 years</td> <td>78-100</td> </tr> </table>	< 15 days	100-115	15 days - 14 weeks	85-105	14 weeks - 2 years	71-90	2 years - 5 years	71-90	5 years - 12 years	77-94	> 12 years	78-100	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
< 15 days	100-115															
15 days - 14 weeks	85-105															
14 weeks - 2 years	71-90															
2 years - 5 years	71-90															
5 years - 12 years	77-94															
> 12 years	78-100															
Mean platelet volume (MPV)	fL	No normal range	NA	Haematology (cross-site)												
Methotrexate	umol/L	No stated range. Local LTHT algorithms in use by clinical teams for interpretation.	NA	Biochem (cross-site)												
Monocytes	x10 <sup>9</sup> /L	<table border="0"> <tr> <td>&lt; 14 days</td> <td>0.3 - 1.5</td> </tr> <tr> <td>2 weeks to 1 yr</td> <td>0.2 - 1.5</td> </tr> <tr> <td>1 to 6 yrs</td> <td>0.2 - 1.5</td> </tr> <tr> <td>6 to 10 yrs</td> <td>0.2 - 1.5</td> </tr> <tr> <td>&gt;10 yrs</td> <td>0.2 - 0.8</td> </tr> </table>	< 14 days	0.3 - 1.5	2 weeks to 1 yr	0.2 - 1.5	1 to 6 yrs	0.2 - 1.5	6 to 10 yrs	0.2 - 1.5	>10 yrs	0.2 - 0.8	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)		
< 14 days	0.3 - 1.5															
2 weeks to 1 yr	0.2 - 1.5															
1 to 6 yrs	0.2 - 1.5															
6 to 10 yrs	0.2 - 1.5															
>10 yrs	0.2 - 0.8															
N-terminal pro B-type natriuretic peptide (NT-pro BNP)	ng/L (equivalent to pg/mL)	<p>&lt; 400 ng/L: Low result which indicates a low probability of heart failure syndrome. Consider alternative diagnosis to explain patient's symptoms/signs. Do not refer to the heart failure service based on this result.</p> <p>400 - 2000 ng/L: Intermediate result which is associated with a 25% chance of heart failure syndrome. Please refer to the heart failure service. Do not request Direct Access Echo as this will lead to a delay in diagnosis.</p> <p>&gt;2000 ng/L: HIGH result which is associated with a 50% chance of heart failure syndrome. Please refer urgently to the heart failure service.</p>	NICE Chronic Heart Failure in adults:management guideline (CG108). Comments as per LTHT Consultant Cardiologist advice.	LGI Biochem												



Neutrophils	x10 <sup>9</sup> /L	<p>&lt; 14 days 1.5 - 10.0</p> <p>2 to 13 weeks 1.5 - 7.0</p> <p>13 weeks to 1 yr 1.5 - 7.0</p> <p>1 to 6 yrs 2.0 - 6.0</p> <p>6 to 10 yrs 2.0 - 6.0</p> <p>&gt;10 yrs 2.0 - 7.5</p>	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
Oestradiol	pmol/L	<p>Oestradiol reference ranges for female patients are provided as report comments, with further interpretation as appropriate.</p> <p>Females &lt; 8 yrs &lt;10</p> <p>Pre-pubertal females &lt;10</p> <p>Post-pubertal, pre-menopausal females Follicular phase 72 - 529 Ovulatory phase 235 - 1309 Luteal phase 205 - 786</p> <p>Post-menopausal females &lt; 118</p> <p>Males &lt; 150</p>	Updated October 2022 in line with Siemens stated ranges (See IFU for Centaur XPT Rev M and Atellica Rev 05)	Biochem (cross-site)
Osmolality	mOsmol/kg	275 - 295	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Osmolality (Fluid)	mOsmol/kg	No normal range	NA	Biochem (cross-site)
Osmolality (Urine)	mOsmol/kg	No normal range	NA	Biochem (cross-site)
Packed Cell Volume (PCV, equivalent to haematocrit, HCT)	(no units)	<p>&lt;2 weeks 0.42-0.6</p> <p>2 - 14 weeks 0.32-0.44</p> <p>14-52 weeks 0.33-0.44</p> <p>1-5 yr 0.36-0.44</p> <p>5-12 yr 0.35-0.45</p> <p>&gt;12 yr (Female) 0.37-0.47</p> <p>&gt;12 yr (Male) 0.40-0.52</p> <p>&gt;12 yr (Unknown) 0.37-0.52</p>	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
Paracetamol	mg/L	-	NA	Biochem (cross-site)
Parathyroid hormone (PTH)	pmol/L	1.5-7.6 (should be interpreted in the light of adjusted calcium result)	Siemens stated ranges in use as of 2008 (See IFU for Centaur XPT & Atellica, Revs E & .02)	Biochem (cross-site)
Phenobarbitone	mg/L	10 - 40	See LHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)

Phenytoin	mg/L	5 - 20	See LHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. www.pathologyharmony.co.uk	Biochem (cross-site)		
Phosphate	mmol/L	<u>Age</u>	<u>Male</u>	<u>Female</u>	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk Caliper ranges for paediatric patients implemented August 2020	Biochem (cross-site)
		0 - 1y	1.36 - 2.49	1.36 - 2.49		
		1y - 5y	1.42 - 1.99	1.42 - 1.99		
		5y - 13y	1.29 - 1.84	1.29 - 1.84		
		13y - 16y	1.05 - 1.82	1.05 - 1.68		
		16y - 19y	0.87 - 1.57	0.87 - 1.57		
19y and above	0.80 - 1.50	0.80 - 1.50				
Phosphate (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)		
Phosphate (urine)	mmol/L	No normal range	NA	Biochem (cross-site)		
Phosphate (24hr Urine)	mmol/Day	15.0-50.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)		
Plasma Viscosity (PV)	m.Pa.s	1.50-1.72	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)		
Platelets	x10 <sup>9</sup> /L	150-400	Based on 'Dacie & Lewis Practical Haematology 10th edn (2006) adult range.	Haematology (cross-site)		
Potassium	mmol/L	<5 wk	3.4 - 6.0	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)	
		5 wk - 2 yr	3.5 - 5.7			
		2 - 17 yr	3.5 - 5.0			
		>17 yr	3.5 - 5.3			
Potassium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)		
Potassium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)		
Potassium (24hr Urine)	mmol/Day	35-90	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)		
Potassium (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)		
Procalcitonin (PCT)	ng/mL	<0.1. Local algorithms in use for interpretation and monitoring of PCT and management of antibiotic therapy.	Manufacturer stated ranges used (Rev.G 2017) (Siemens recommended range based on the BRAHMS PCT sensitive KRYPTOR assay information provided by Thermo Fisher)	Biochem (cross-site)		

Procollagen type III (PIIINP)	ug/L	3.2-6.0 µg/L. Indications for considering liver biopsy are: - If pre-treatment PIIINP >10 µg/L, If PIIINP > 6 µg/L on 3 occasions in a 1yr period, If PIIINP > 10 µg/L on 2 consecutive occasions.	Local evaluation of Siemens assay vs established Orion Diagnostics RIA (2013)	Biochem (cross-site)
Progesterone	nmol/L	Females: A serum progesterone >35 nmol/L is consistent with ovulation if sample taken on day 21 of a 28 day menstrual cycle, or 7 days before a menstrual period in irregularly cycling women. Males 0.89-3.88 nmol/L	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prolactin	mU/L	Males <550 Females <600	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prostate specific antigen (PSA)	µg/L	Males ≤ 49 years < 2.5 Males 50 - 59 years < 3.5 Males 60 - 69 years < 4.5 Males ≥ 70 years < 6.5	Updated October 2022 in line with NICE guidance NG12 and by agreement of the Urology Group at West Yorkshire & Harrogate Cancer Alliance.	Biochem (cross-site)
Protein (serum total)	g/L	60 - 80	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Protein (CSF)	g/L	0.2 - 0.4		Biochem (cross-site)
Protein (fluid)	g/L	No normal range	NA	Biochem (cross-site)
Protein (urine)	g/L	No normal range	NA	Biochem (cross-site)
Protein:creatinine ratio (urine)	mg/mmol	<13	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Protein (24hr Urine)	g/Day	<0.14	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prothrombin time (PT)	s	9.0 - 14.0	Locally determined 2006	Haematology (cross-site)
Red Cell Count (RBC)	x10 <sup>12</sup> /L	< 14 days 4.0 - 6.0 2 to 13 weeks 3.2 - 4.8 13 weeks to 1 yr 3.6 - 5.2 1 to 4 yrs 4.1 - 5.5 4 to 12 yrs 4.0 - 5.4 > 12 yrs male 4.5 - 6.5; female 3.8 - 5.8	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)

Red Cell Distribution (RDW)	CV%	11.5-15.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Reptilase time	s	13.5 - 22.0	Local evaluation Jan 2017 - New reagent introduced	Haematology (cross-site)
Reticulocytes (absolute)	x10 <sup>9</sup> /L	20 - 80	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Reticulocytes	%	0.8-1.8	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Rheumatoid Factor (RF)	iU/mL	<14 (male and female)	Siemens IFU for Advia Chemistry XPT (Rev F)	Biochem (cross-site)
Ristocetin co-factor (Automated)	iU/dL	54 - 158	Locally determined 2012	SLM (SJUH)
Salicylate	mg/L	-	NA	Biochem (cross-site)
Sex hormone binding globulin (SHBG)	nmol/L	Male 14.55 - 113.3 Female (pre-menopausal) 10.84 - 180	Siemens stated ranges for Centaur XPT as described in IFU Rev D (2020)	LGI Biochem
Sodium	mmol/L	133 - 146	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Sodium (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (24hr Urine)	mmol/Day	130-260	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Teicoplanin	mg/L	Target range will depend on clinical indication for prescription.	NA	LGI Biochem
Testosterone	nmol/L	Male 8-27 Female 0-2.8	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Theophylline	mg/L	10 - 20 (adult) 5 - 10 (neonate)	See LHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Thrombin time	s	10 -17	Locally determined 2006	Haematology (cross-site)

Thyroglobulin	ug/L	Thyroglobulin is only useful in the follow-up of patients with thyroid cancer. Values should be less than 0.1 ug/L after thyroidectomy and radio-iodine.	See Beckman Access IFU (Rev J), stated limit of detection of 0.1 ug/L used.	LGI Biochem
Thyroglobulin antibodies	iU/mL	<4.0	See Beckman Access IFU (Rev K).	LGI Biochem
Thyroid peroxidase antibodies (TPO)	U/mL	Action limit >100	Local evaluation January 2011	Biochem (cross-site)
Thyroid stimulating hormone (TSH)	mU/L	0.2-4.0	Local evaluation January 2011	Biochem (cross-site)
TmP/GFR (Phosphate excretion)	mmol/L	>16 yrs 0.80-1.35	See Tietz Textbook of Clinical Chemistry 4th ed 2006.	Biochem (cross-site)
Tobramycin	mg/L	The therapeutic range for tobramycin is variable and dependent on the regimen used (i.e. once daily or multi-dose) and the condition being treated.	NA	Biochem (cross-site)
Total Iron Binding Capacity (TIBC)	umol/L	54-80	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Total T3 (TT3)	nmol/L	0.9-2.5	Local evaluation January 2011	Biochem (cross-site)
Triglycerides	mmol/L	fasting <2.3	Based upon the European Atherosclerosis Societies recommendations (Europ Heart J 1987; 8: 77-88)	Biochem (cross-site)
Triglycerides (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Troponin I (high sensitivity)	ng/L	Siemens high sensitivity troponin I assay in use. If clinically relevant, myocyte damage is indicated by a >20% change in troponin level on samples taken at least 3h apart, with at least one value greater than 37 ng/L (females) or 57 ng/L (males) (99th percentile).	Based on manufacturer stated 99th percentile value for the assay and clinical discussion with LTHT users.	Biochem (cross-site)
Urate (uric acid)	umol/L	Male Female 200 - 430 140 - 360	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochem (cross-site)
Urate (fluid)	umol/L	No normal range	NA	Biochem (cross-site)
Urate (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Urate:Creatinine ratio (urine)	mmol/mmol creat	up to 1 year 1-2 yrs 2-6 yrs 6-10 yrs >10 yrs 0.43 - 1.52 0.57 - 1.26 0.36 - 0.83 0.15 - 0.67 0.17 - 0.45	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Urate (24hr Urine)	mmol/day	1.50-4.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Urea	mmol/l	<5 wk 5 wk - 2 yr 0.8 - 5.5 1.0 - 5.5	Harmony ranges implemented Sept 2011	Biochem (cross-site)

Urea	mmol/L	2 - 17 yr >17 yr	2.5 - 6.5 2.5 - 7.8	www.pathologyharmony.co.uk	Biochem (cross-site)
Urea (CSF)		No normal range		NA	Biochem (cross-site)
Urea (urine)	mmol/L	No normal range		NA	Biochem (cross-site)
Urea (24hr Urine)	mmol/Day	250-900		Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Valproate	mg/L	None quoted - for compliance only		NA	Biochem (cross-site)
Vancomycin	mg/L	Normal pre-dose Vancomycin therapeutic range is 10 to 20 mg/L		BNF recommendations (checked 2017)	Biochem (cross-site)
Vitamin B12	ng/L	211-911		Siemens stated ranges used as of 2008 (Confirmed in Centaur XPT and Atellica IFU Revs T & .01)	Biochem (cross-site)
von Willebrands Factor Antigen	iU/dL	50.2 - 153.8		Locally determined, checked in 2003	Haematology (cross-site)
White cell count (WBC)	x10 <sup>9</sup> /L	< Day 1 Day 1-3 Day 3-7 Weeks 1-6 Weeks 6-14 <1 yr 1-6 yr 6-11 yr > 11yr	10.0 - 25.0 9.0 - 15.0 5.0 - 21.0 7.0 - 15.0 6.0 - 15.0 6.0 - 16.0 6.0 - 14.0 4.5 - 13.5 4.0 - 11.0	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
White Cell Count (CSF)		No normal range		NA	Haematology (cross-site)
White Cell Count (Fluid)		No normal range		NA	Haematology (cross-site)