

Laboratory tests with gender-specific reference ranges (excluding hormones)

NHS Lothian Laboratories (March 2020)

Some laboratory measurements use sex-specific reference ranges. This can create difficulties and potentially errors in transgender patients. Those analytes with different male vs female reference ranges (excluding reproductive hormones) that are reported by NHS Lothian labs are listed below. The evidence base on how to interpret these values in trans patients receiving gender-affirming hormone treatment is poor, but we suggest that the use of the assigned sex at birth is most appropriate, with the exception of haematocrit as that is testosterone sensitive, so a male reference range should be used in those treated with testosterone.

	Adult Female Reference range	Adult Male Reference Range	Misinterpretation risk
Renal markers			
Creatinine	50 - 98 µmol/L	64 - 111 µmol/L	Errors in diagnosis of kidney disease. eGFR calculation will also be inaccurate. Note that creatinine is produced by muscle so as body composition changes during the transition this will impact on creatinine levels.
Urate	0.12 - 0.36 mmol/L	0.12 - 0.42 mmol/L	Errors in diagnosis of gout
Alb:Creatinine ratio	0 – 3.5 mg/mmol	0 – 2.5 mg/mmol	Errors in diagnosis of microalbuminuria
Urinary creatinine	4.1 – 14.5 mmol/24hr	6.3 – 22.7 mmol/24hr	This test is used to quantify whether a 24 hour urine collection has been over or under completed. Could impact on any 24 hour urine investigation e.g. metadrenalines (phaeochromocytoma), cortisol (Cushing's), 5HIAA (carcinoid) or any other test involving a 24 hour urine collection. Again as body composition changes during the transition the impact of this is difficult to quantify
Liver markers			
ALP	16 - 20 yrs: 40 - 200 U/L	16 - 20 yrs: 50 - 250 U/L	Errors in diagnosis of liver disease. clinical risk is low as only 16-20 year age group affected.
GGT	5 - 35 U/L	10 - 55 U/L	Errors in diagnosis of liver disease. clinical risk is low as further investigation of abnormal GGTs recommended when GGT>100
Cardiac markers			
Troponin I	1-16 ng/L	1-34 ng/L	<i>HIGH clinical risk of misinterpretation of troponin levels in investigation of patients for acute coronary syndrome*</i>

Creatinine kinase	35 – 135 U/L	55 – 170 U/L	Errors in identifying muscle disorders.
Full blood count			
Haemoglobin	115 - 160 g/L	135 - 180 g/L	Misdiagnosis of anaemia and/or polycythaemia. Please use <u>male reference range</u> if person is receiving exogenous testosterone.
RBC count	3.8 - 5.8x10 ¹² /L	4.6 – 6.5x10 ¹² /L	
Haematocrit	0.37 – 0.47	0.40 – 0.52	
Haematinics			
Ferritin	20 - 300 µg/L	15 – 200 µg/L	Errors in diagnosis iron deficiency/overload.
Iron	14 - 32 µmol/L	10 – 28 µmol/L	
Lipids			
HDL-chol.	1.1 – 1.7	0.9 – 1.4	Errors in estimating cardiovascular risk
Tumour markers			
PSA	N/A	< 60 yrs: 0 - 3.0 µg/L 60-70 yrs: 0 - 4.0 µg/L > 70 yrs: 0 - 5.0 µg/L	Errors in diagnosis prostate cancer/hyperplasia
hCG	Pre-menopausal: <5 U/L Post-menopausal:<10 U/L	Males: <2 U/L	Errors in diagnosis testicular malignancy
CA125	0-35 kU/L	N/A	Errors in diagnosis ovarian malignancy

***TROPONIN I LEVELS.**

The risks are that – if the clinician is not aware of trans status - then:

- Transgender females with a Troponin I level of 17-34 might be mistakenly treated for a myocardial infarct, where this level is normal for their assigned sex at birth
- Transgender males with a Troponin I level of 17-34 may have a myocardial infarct missed as this is abnormal for their assigned sex at birth.

The laboratories report low troponin rises (requiring ultrasensitive assays and sex specific reference ranges) because of the evidence of a significant mortality associated with these, and a mortality benefit from intervening and treating people on the basis of such small troponin rises.

Those involved in this guidance (clinical biochemistry, reproductive endocrine, transgender specialists) are unable to currently find other reliable significant literature in this area, including whether undergoing gender reassignment impacts on cardiac muscle mass and resultant troponin levels.