



# NATIONAL LABORATORY HANDBOOK

## Chemical Pathology Laboratory Profiles

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## Scope

The aim of this document is to provide proposals for minimum set tests to be included in nationally standardised profiles for liver, renal, bone and thyroid investigations.

## Key recommendations

### Renal Profiles:

Urea & Creatinine:	<i>Urea</i>	<i>Creatinine</i>	<i>eGFR</i>			
U/E:	<i>Urea</i>	<i>Creatinine</i>	<i>eGFR</i>	<i>Na<sup>+</sup></i>	<i>K<sup>+</sup></i>	<i>*Cl</i>
Renal Profile:	<i>Urea</i>	<i>Creatinine</i>	<i>eGFR</i>	<i>Na<sup>+</sup></i>	<i>K<sup>+</sup></i>	<i>Cl</i>
	<i>Bicarb</i>	<i>Anion Gap</i>				

\*Chloride optional field

The CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) equation should be used to estimate glomerular filtration rate (eGFR) for patients over 18 years of age.

#### **Liver Chemistry Profile:**

<i>Bilirubin</i>	<i>Gamma glutamyl transferase (GGT)</i>
<i>Alkaline phosphate (ALP)</i>	<i>Total protein</i>
<i>Alanine aminotransferase (ALT)</i>	<i>Albumin</i>
<i>Globulin (calculated)</i>	<i>AST as an optional field</i>

#### **Bone Profile:**

<i>Calcium</i>	<i>Albumin</i>
<i>Adjusted calcium</i>	<i>Phosphate</i>
<i>Alkaline phosphate</i>	<i>Magnesium (optional).</i>

#### **Thyroid Function Profile:**

*Thyroid stimulating hormone (TSH) Free thyroxine (FT4)*

### **Background**

The national MedLIS system will introduce an integrated national laboratory information system. MedLIS will ensure Irish healthcare providers have 24 hour access to complete and up to date accurate laboratory medicine data that meets the needs of both patients and healthcare providers.

MedLIS provides a single instance of software and database and will replace the current fragmented systems with a single national system that will deliver standardised laboratory information that supports patient healthcare. The projected time frame for roll out to all national laboratories is a four year period.

In order to support the MedLIS national build the National Clinical Programme for Pathology (NCPP) Clinical Lead has established a number of working groups to facilitate discussions with relevant disciplines on the appropriate tests, test names profiles etc.

### **Renal Profile**

There are few strict definitions of a renal profile. Sodium (Na<sup>+</sup>), potassium (K<sup>+</sup>), urea with or without chloride (Cl<sup>-</sup>), bicarbonate (HCO<sub>3</sub><sup>-</sup>) and creatinine form the set of tests generally known as urea and electrolytes (U/E). Electrolytes include Na<sup>+</sup>, K<sup>+</sup> with or without Cl<sup>-</sup> and HCO<sub>3</sub><sup>-</sup>.

Most auto-analysers measure within a single block of ion-specific electrodes and has led to widespread practice of reporting Na<sup>+</sup>, K<sup>+</sup> and Cl<sup>-</sup> or the requirement to suppress one or more of the electrolytes.

There is also widespread practice in provision of both urea and creatinine with creatinine used to calculate the estimated glomerular filtration rate (eGFR).

The working group recommended that the renal profile should vary in its components based upon the origin of the request i.e. specific general practice set, acute medical/surgical set and a renal set.

**Recommended Renal Profiles:**

Urea & Creatinine:	Serum/plasma	Urea	Creatinine	eGFR			
U/E:	Serum/plasma	Urea	Creatinine	eGFR	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>-*</sup>
Renal Profile:	Serum/plasma	Urea	Creatinine	eGFR	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>-</sup>
		Bicarb	Anion gap				

\*(Chloride as an optional field.)

The CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) equation should be used to estimate glomerular filtration rate (eGFR) for patients over 18 years of age.

**Liver Chemistry Profile**

The Liver Chemistry Profile commonly referred to as the ‘Liver Function Tests’ include a number of analytes primarily used to detect liver disease. Few measure liver function as such but provide information about the state of a patient’s liver. Some tests are associated with functionality (albumin), cellular integrity (transaminases) and some with conditions of the biliary tract (gamma GT, ALP).

Current liver profiles vary between laboratories and historically have contained some or all of the following:

- Amino aspartate transaminase (AST)                      Alanine aminotransferase (ALT)
- Conjugated/unconjugated bilirubin                      Alkaline phosphatase (ALP)
- Gamma glutamyl transferase (GGT)                      Total protein (TP)
- Albumin    Globulin (calculated)
- Lactate dehydrogenase (LDH)

The Chemical Pathology Working group proposed the following basic profile for non-pregnant adults:

**Recommended Liver Chemistry Profile** to include as standard:

Serum/plasma bilirubin	Serum/plasma ALP
Serum/plasma ALT	Serum/plasma GGT
Serum/plasma total protein	Serum/plasma albumin
Serum/plasma globulin (calculated)	Amino aspartate transaminase (AST) as an optional field

It was recommended that an algorithm be developed for the use of calculated globulin.

Additional tests may be included as second line tests depending on specific situations by selection from the test menu.

Calculated globulin is helpful, is easily done and therefore should be done automatically when total protein and albumin are provided. Some laboratory IT systems currently may not be able to do an automatic calculation but this will be mandatory post MedLIS roll out.

## Bone Profile

Bone profiles are used in the screening and investigation of potential disorders of calcium and bone metabolism and in the monitoring of disorders of calcium and bone metabolism.

Potential tests included in bone profiles include:

Calcium	Albumin	Phosphate
ALP	Magnesium	Parathyroid hormone (PTH)
Vitamin D (25-OH)		

The Chemical Pathology Working group proposed the following basic profile for non-pregnant adults:

**Recommended Bone Profile** to include as standard:

Serum/plasma calcium	Serum/plasma albumin
Serum/plasma adjusted calcium	Serum/plasma phosphate
Serum/plasma ALP	Serum/plasma magnesium as an optional field.

Additional tests that may be included as second line tests depending on specific situations by selection from the test menu include:

Plasma parathyroid hormone (PTH)	Serum/plasma vitamin D (25-OH)
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## Thyroid Function Profile

Thyroid function tests are among the most common test requests received in Irish Laboratories. Thyroid function tests include:

Thyroid stimulating hormone (TSH)	Free thyroxine (FT4)
Total thyroxine (TT4)	Free tri-iodothyronine (FT3)

Total tri-iodothyronine (TT3).

Different laboratories use different combinations of these tests as their front line investigations. Free hormone levels reflect the biologically active hormone but total hormone should be available for situations where abnormal total binding globulin concentrations are raised (e.g. pregnancy, liver disease, oral contraceptive use). Initial measurement of both TSH and T4 together provides the most satisfactory assessment of thyroid status.

The Chemical Pathology Working group proposed the following front line thyroid investigation profile:

**Recommended Thyroid Function Profile** to include as standard:

Serum/plasma thyroid stimulating hormone (TSH)

Serum/plasma free thyroxine (FT4)

Guidelines regarding appropriate use of thyroid function testing (TFTs) in adults in primary care<sup>(1)</sup> were published in Volume 1 of the National Laboratory Handbook. The guideline applied to adults (greater than 16 years) and not to preconception/pregnancy monitoring or children.

### **Guideline Development Methodology- Consultation Plan and History**

The guideline was drafted by the authors, followed by expert consultation with the Faculty of Pathology Chemical Pathology sub-committee. Following incorporation of feedback, the guideline was submitted to the full National Clinical Programme for Pathology Consultation Process.

### **References**

1 Boran, G., Sherlock, M., Moran, N., McGowan, A: Thyroid Function Tests: National Clinical Programme for Pathology, Laboratory Handbook, Volume 1

<https://www.hse.ie/eng/about/who/cspd/ncps/pathology/resources/guideline-4-use-of-tyroid-function-tests-in-primary-care.pdf>