

National minimum retesting intervals in pathology

A final report detailing consensus recommendations for minimum retesting intervals for use in pathology

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1 Introduction

There is currently a drive in pathology to harmonise processes and remove unnecessary waste, thereby saving money. In addition, any intervention that acts to reduce waste and avoid unnecessary phlebotomy/booking appointment for the patient can only be seen as contributing to the optimisation of patient care. At a time when many laboratories and providers are implementing electronic requesting of laboratory tests, which allows the requestor and the laboratory to manage what is requested, there needs to be a solution to support this process based on the best available evidence. Similar initiatives have been reported including the work of the Pathology Harmony Group and the recent proposal to standardise test profiles.^{1,2} How often a test should be repeated, if at all, should be based upon a number of criteria: the physiological properties, biological half-life, analytical aspects, treatment and monitoring requirements, and established guidance. This report proposes a set of consensus recommendations from the perspective of pathology and laboratory medicine.

1.1 What is a minimal retesting interval?

Minimal retesting intervals (MRI) are defined as the minimum time before a test should be repeated, based on the properties of the test and the clinical situation in which it is used.

1.2 Establishing MRIs

The original work on MRI was carried out with the support of the Association for Clinical Biochemistry and Laboratory Medicine (ACB) and was published in 2013.³ They were prepared through the members of the Clinical Practice Section (CPS) of the ACB. This group represents the medically qualified practitioners in clinical biochemistry who are members of the ACB. The methodology is briefly described below.

A survey and a literature search was performed using a strategy previously used in this area.⁴ However, little published evidence was identified on the use or production of MRIs in clinical practice.

The next phase of the project was the convening of small groups, made up of invited members of the Clinical Practice Section of the ACB, to investigate the evidence and existing guidelines and prepare recommendations in a number of work streams. The method used was an approach based on that used by Glaser *et al* termed 'the state of the art'.⁵

The evidence or source for these recommendations has been taken from a number of authorities such as the National Institute for Health and Clinical Excellence (NICE), NHS Clinical Knowledge Summaries (CKS) (formerly PRODIGY) and the Scottish Intercollegiate Guidelines Network (SIGN). The CKS are a reliable source of evidence-based information and practical 'know how' about the common conditions managed in primary care that were identified following a literature search and expert opinion strategy.

When the draft recommendations were completed, they were sent to an independent reviewer for assessment and comment.

The final stage of this project was a review of the prepared recommendations by a panel made up of representatives of the authors from each major region of the UK and invited members from the ACB Executive. The recommendations were discussed and accepted by consensus. Where no evidence-based guidance existed either in the literature or published guidance, recommendations were prepared based on the consensus opinion of the working group. The final document was then sent out for final consultation by the full membership of the Clinical Practice Section and the chairs of each ACB region before submission to the ACB Executive.

A similar approach was used in the preparation of these pan-pathology recommendations. It should be noted that only Disciplines with anticipated MRI development are included in this draft.

1.3 Using minimum retesting intervals in practice

The recommendations presented in this document are intended to provide assistance in appropriately managing test requesting at all levels of the request cycle. They are intended to be used in a number of different scenarios, either delivered manually or via a laboratory/remote requesting computer system:

1. Education of requesters so that appropriate tests are requested at the right time and for the right patient.
2. Information on request cards or in pathology handbooks on when to repeat a test.
3. Delivery of prompts to remind requester at point of requesting via remote/ward requesting software that a request is either too soon or inappropriate, with the facility to review previous results or ask questions. There should also be an option to record the reason for overriding a MRI.
4. Implementation of logic rules in the laboratory to remove or restrict requests based on previous patient data.

Any MRI being used must reflect not only the assay being used but also how it is being used – thus the MRI must reflect the local protocol. It should also be implemented following full consultation with the users, ideally supported with an education package if required. It is important to understand the mechanism employed to restrict any test or its request so that it does not appear too restrictive. There must always be the option for the clinicians/requesters to override a rule if they feel that it is clinically appropriate to continue to request the test. How this is managed will reflect the way a test is requested locally. Ideally, there must be an opportunity for requestors to record their reason to override a rule and conversely to inform the requestor, at the earliest opportunity, why it has been rejected. The availability of previously reported laboratory results at or before the time of requesting a new test would greatly assist the requester in deciding whether a test was appropriate. To support this initiative, the availability of up to date clinical history from the requester or the patient's electronic patient record is of paramount importance so that prepared logic rules or MRIs can be correctly implemented. The implementation of electronic requesting of tests provides an opportunity to improve the quality of information received from the requester for the laboratory to use. When a profile is recommended this refers to the standardised profile.² It may also be useful to allow the requester to request individual tests from a recognised profile so that only the required and necessary tests are performed. Limiting a test's use may also be achieved by restricting the requesting of a repeat test to a particular grade or level of staff so that only those of an appropriate level may have access to a particular test.

If implementing the MRI into a laboratory information system or remote request system the programmer must be aware of how the system counts time so that the correct unit is used.

1.4 Terms and conditions of use

These recommendations represent best practice in the opinion of the authors and have been reviewed through a consensus approach. However, new evidence at any time can invalidate these recommendations. No liability whatsoever can be taken as a result of using this information.

These recommendations should not be used in paediatric/neonatal patients unless specifically stated.

1.5 References

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2 Abbreviations

AACE	American Association of Clinical Endocrinologists
Ab	Antibody
ACB	Association for Clinical Biochemistry and Laboratory Medicine
AFB	Acid-fast bacilli
ALP	Alkaline phosphatase
AMPA	2 Amino-3 (5-Methyl 3 Oxo-1,2 Oxazole 4 Yl) Propanoic Acid
ANA	Antinuclear Antibody
ANCA	Antineutrophil Cytoplasmic Antibodies
APTT	Activated Partial Thromboplastin Time (APTT)
ASCO	American Society of Clinical Oncology
ASO	Antistreptolysin O
ATPOab	Anti-Thyroid Peroxidase Antibodies
BCSH	British Committee for Standards in Haematology
BMI	Body Mass Index
BNF	British National Formulary
BSPGHAN	British Society of paediatric Gastroenterology, Hepatology and Nutrition
BSH	British Society for Haematology
C3	Complement Component C3
C4	Complement Component C4
CA125	Carbohydrate Antigen 125
CA15.3	Carbohydrate 15.3
CA 19.9	Carbohydrate Antigen 19.9
CDC	Center for Disease Control
CCP	Cyclic Citrullinated Peptide Antibody
CEA	Carcinoembryonic Antigen
CFT	Complement Fixation Test
CG	Clinical Guideline
CHF	Congestive Heart Failure
CKD	Chronic Kidney Disease
CKS	Clinical Knowledge Summaries
CMV	Cytomegalovirus
CPS	Clinical Practice Section
EASL	European Association of the Study of the Liver
ED	Exposure day
e-GFR	Estimated Glomerular Filtration Rate
EGTM	European Group on Tumour Markers
EP	Electrophoresis
ESR	Erythrocyte Sedimentation Rate
ESC	European of Society of Cardiology
FSH	Follicule Stimulating Hormone
FBC	Full Blood Count
FMH	fetomaternal haemorrhage
ft3	Free Triiodothyronine
ft4	Free Thyroxine
GAD65	glutamic acid decarboxylase antibody
GAIN	Guidelines and Audit Implementation Network
GGT	Gamma-glutamyltransferase
GPC	Gastric Parietal Cell Antibody
Hb	Haemoglobin
HBV	Hepatitis B virus

HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
HSV	Herpes simplex virus
HVS	High vaginal swab
Ig	Immunoglobulin
IGF-1	Insulin-like Growth Factor 1
IHD	Ischaemic Heart Disease
INR	International Normalised Ratio
ITT	Immune Tolerance Therapy
ITU	Intensive Treatment Unit
IUCD	Intrauterine contraceptive device
IV	Intravenous
IVF	<i>In vitro</i> Fertilisation
LCMS	Liquid Chromatography Mass Spectrometry
LFT	Liver Function Tests
MAG	Myelin Associated Glycoprotein
MDRD	Modification of Diet in Renal Disease
MMWR	Morbidity and Mortality Weekly Report
MOG	Myelin oligodendrocyte
MPO	Myeloperoxidase Antibodies
MRI	Minimum Retesting Intervals
MRSA	Meticillin-resistant staphylococcus aureus
MTC	Medullary Thyroid Carcinoma
MUSK	Muscle specific kinase
NA	Not Applicable
NAAT	Nucleic acid amplification test
NICE	National Institute for Health and Clinical Excellence
NIH	National Institute for Health
NMDA	N-methylaspartate
NPHS	National Public Health Service
PD	Peritoneal dialysis
Plt	Platelets
PR3	Proteinase 3 Antibodies
PT	Prothrombin time
RCOG	Royal College of Obstetricians and Gynaecologists
RCPATH	Royal College of Pathologists
RF	Rheumatoid Factor
SAC	Specialty Advisory Committee of RCPATH
SIGN	Scottish Intercollegiate Guidelines Network
TB IFN	Tuberculosis Interferon
TFT	Thyroid Function Tests
TPN	Total Parenteral Nutrition
TSH	Thyroid Stimulating Hormone
tTG	Tissue Transglutaminase
U&E	Urea and Electrolytes
UKMI	UK Medicines Information
UK-SMI	UK standards for microbiology investigations
VGCC	Voltage gated calcium channel
VGKC	Voltage gated potassium channel
VKA	Vitamin K Antagonist
VP	Venture Publications
VZV	Varicella zoster virus
WCC	White Cell Count

3 Biochemistry recommendations

3.1 Renal – refers to the measurement of U&Es, unless otherwise stated

REF	Clinical situation	Recommendation	Source
B-R1	Normal follow up	A repeat would be indicated on clinical grounds if there were a significant change in the patient's condition which indicated an acute renal (or other electrolyte related problem) is developing	Consensus opinion of the relevant expert working group
B-R2	Inpatient monitoring of a stable patient	An inpatient with an admission sodium within the reference range should not have a repeat sodium within the average length of stay of 4 days	Consensus opinion of the relevant expert working group
B-R3	Inpatient monitoring of a stable patient on IV fluids, adults as well as children	Daily monitoring of U&Es and glucose	Guidelines and Audit Implementation Network. <i>Hyponatraemia in adults (on or after 16th birthday)</i> . GAIN, 2010. http://www.gain-ni.org/images/Uploads/Guidelines/Hyponatraemia_guideline.pdf
B-R4	In symptomatic patients or following administering of hypertonic saline	Monitoring should be more frequent, i.e. every 2–4 hours	Guidelines and Audit Implementation Network. <i>Hyponatraemia in adults (on or after 16th birthday)</i> . GAIN, 2010. http://www.gain-ni.org/images/Uploads/Guidelines/Hyponatraemia_guideline.pdf
B-R5	Patient diagnosed with acute kidney injury	U&Es checked on admission and within 24 hours	UK Renal Association. <i>Clinical Practice Guideline, Acute Kidney Injury, 5th edition</i> . Renal Association: Hampshire, 2011. www.renal.org/guidelines/modules/acute-kidney-injury
B-R6	Monitoring of ACE inhibitors	Within 1 week of starting and 1 week after each dose titration. Then annually (unless required more frequently because of impaired renal function)	Clinical Knowledge Summary. <i>Hypertension – not diabetic</i> . National Institute for Health and Care Excellence, 2014. http://cks.nice.org.uk/hypertension-not-diabetic
B-R7	Diuretic therapy	Before the initiation of therapy and after 4 weeks, and then 6 monthly/yearly or more frequently in the elderly or in patients with renal disease, disorders affecting electrolyte status or those patients taking other drugs, e.g. corticosteroids, digoxin	Clinical Knowledge Summary. <i>Hypertension – not diabetic</i> . National Institute for Health and Care Excellence, 2014. http://cks.nice.org.uk/hypertension-not-diabetic

REF	Clinical situation	Recommendation	Source
B-R8	Monitoring of potassium concentrations in patients receiving digoxin	Eight days after initiation or change in digoxin therapy and/or addition/subtraction of interacting drug. Then annually if no change	North West Medicines Information Service. <i>Monitoring Drug Therapy</i> . Liverpool: UK Medicines Information, 2002. Clinical Knowledge Summary. <i>Atrial Fibrillation</i> . National Institute for Health and Care Excellence, 2014. www.cks.nice.org.uk/atrial-fibrillation Clinical Knowledge Summary. <i>Heart failure – chronic</i> . National Institute for Health and Care Excellence, 2010. www.cks.nice.org.uk/heart-failure-chronic
B-R9	Monitoring of potassium concentrations on patients receiving digoxin and diuretics	Regular monitoring	National Public Health Service for Wales. <i>Drug Monitoring: A Risk Management System, First Revision</i> . NPHS: Wales, 2008.
B-R10	Aminosalicylates	In the elderly, every 3 months in first year, then every 6 months for next 4 years then annually after that based on personal risk factors	Clinical Knowledge Summary. <i>Crohn's disease</i> . National Institute for Health and Care Excellence, 2012. http://cks.nice.org.uk/crohns-disease#!prescribinginfo
B-R11	Carbamazepine	6 months	Clinical Knowledge Summary. <i>Crohn's disease</i> . National Institute for Health and Care Excellence, 2012. http://cks.nice.org.uk/crohns-disease#!prescribinginfo
B-R12	Anti-psychotics	12 months	Clinical Knowledge Summary. <i>Crohn's disease</i> . National Institute for Health and Care Excellence, 2012. http://cks.nice.org.uk/crohns-disease#!prescribinginfo
B-R13a	eGFR – MDRD – CKD	Repeat in 14 days if new finding of reduced GFR and/or confirmation of eGFR < 60 mL/min/1.73m ² *eGFR by MDRD not valid in AKI	National Institute for Health Care and Excellence. <i>Chronic kidney disease: early identification and management of chronic kidney disease in adults in primary and secondary care</i> . NICE, 2014. www.nice.org.uk/guidance/cg182

REF	Clinical situation	Recommendation	Source
B-R13b	eGFR – MDRD – Radiological procedures/contrast administration	eGFR or creatinine within previous 7 days in patients with acute illness or renal disease. eGFR for angiography: < 60 mL/min/1.73m ² should trigger local guidelines for contrast dosage eGFR for Gadolinium: <30 mL/min/1.73m ² high risk agents contraindicated eGFR 30–59 mL/min/1.73m ² lowest dose possible can be used and not repeated within 7 days	Royal College of Radiologists. <i>Standards for intravascular contrast agent administration to adult patients (2nd ed)</i> . London: Royal College of Radiologists, 2010.
B-R13c	eGFR – Cockcroft & Gault	For estimating chemotherapy & drug dosages. Within 24 hours unless rapidly changing creatinine concentrations or fluid balance	None (inferred from British National Formulary (BNF))
B-R13d	Iohexol GFR	72 hours to avoid contamination (based on half-life of iohexol of 2 hours)	Krutzén E, Bäck SE, Nilsson-Ehle I, Nilsson-Ehle P. Plasma clearance of a new contrast agent, iohexol: a method for the assessment of glomerular filtration rate. <i>J Lab Clin Med</i> 1984;104:955–961.

3.2 Bone – refers to the measurement of the bone profile, unless otherwise stated

REF	Clinical situation	Recommendation	Source
B-B1	Non-acute setting unless there are other clinical indications	Testing at 3 month intervals	Consensus opinion of the relevant expert working group
B-B2	Acute settings	Testing at 48 hour intervals	Consensus opinion of the relevant expert working group
B-B3	Acute hypo/hypercalcaemia, TPN and ITU patients	May require more frequent monitoring	Consensus opinion of the relevant expert working group
B-B4	ALP and total protein in acute setting	Testing at weekly intervals. ALP may need checking more often, but probably only in the context of acute cholestatic changes. See Liver recommendations	Consensus opinion of the relevant expert working group
B-B5	Vitamin D: no clinical signs and symptoms	Do not retest (whatever the result as there may be no indication to test in first place).	Consensus opinion of the relevant expert working group
B-B6	Vitamin D: cholecalciferol or ergocalciferol therapy for whatever clinical indication, where baseline vitamin D concentration was adequate	Do not retest, unless otherwise clinically indicated e.g. sick coeliac or Crohn's patient	Sattar N, Welsh P, Panarelli M, Frouhi NG. Increasing requests for vitamin D measurement: costly, confusing, and without credibility. <i>Lancet</i> 2012;379:95–96. Sattar N, Welsh P, Panarelli M, Frouhi NG. Vitamin D testing — Authors' reply. <i>Lancet</i> 2012;379:1700–1701.
B-B7	Vitamin D: cholecalciferol or ergocalciferol therapy for whatever clinical indication, where baseline vitamin D concentration was low <i>and</i> where there is underlying disease that might impact negatively on absorption	Repeat after 3–6 months on recommended replacement dose	Consensus opinion of the relevant expert working group
B-B8	Vitamin D: calcitriol or alphacalcidol therapy	Do not measure vitamin D	Consensus opinion of the relevant expert working group

3.3 Liver – refers to the measurement of LFTs, unless otherwise stated

REF	Clinical situation	Recommendation	Source
B-L1	Non acute setting	Testing at 1–3-month intervals	Smellie S, Galloway M, McNulty S. <i>Primary Care and Laboratory Medicine, Frequently Asked Questions</i> London: ACB Venture Publications, 2011.
B-L2	Acute inpatient setting	Testing at 72 hour intervals in acute setting (apart from those in L4)	Consensus opinion of the relevant expert working group
B-L3	GGT and conjugated bilirubin in acute setting	Testing at weekly intervals	Consensus opinion of the relevant expert working group
B-L4	Acute poisoning (e.g. paracetamol), TPN, liver unit, acute liver injury and ITU patients	May require more frequent monitoring	Consensus opinion of the relevant expert working group
B-L5	Neonatal jaundice	These recommendations must not be used in the management of neonatal jaundice	

3.4 Lipids – refers to the measurement of lipid profile (non-fasting), unless otherwise stated

REF	Clinical situation	Recommendation	Source
B-LP1	LOW risk cases for IHD assessment	3 years	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58:1016–1024
B-LP2	Higher risk cases for IHD assessment and those on stable treatment	1 year	Consensus opinion of the relevant expert working group
B-LP3	Initiating or changing therapies	1–3 months	Consensus opinion of the relevant expert working group
B-LP4	When assessing triglyceridaemia to see effects of changing diet and alcohol	1 week	Consensus opinion of the relevant expert working group
B-LP5	In patients on TPN or who have hypertriglyceridaemia-induced pancreatitis	1 day	Consensus opinion of the relevant expert working group

3.5 Endocrine related

(for pregnancy-related endocrinology – see pregnancy)

REF	Clinical situation	Recommendation	Source
B-E1	Thyroid function testing in healthy person in absence of any clinical symptoms	Three years	Consensus opinion of the relevant expert working group
B-E2	Hyperthyroid - monitoring of treatment in Graves' disease	<p>Followup in first 1–2 months after radioactive iodine treatment for Graves' should include fT4 and total T3. If patient remains thyrotoxic then biochemical monitoring to continue at 4–6 week intervals</p> <p>Following thyroidectomy for Graves' disease (and commencement of levothyroxine), serum TSH to be measured 6–8 weeks post-op</p>	Bahn Chair RS, Burch HB, Cooper DS, Garber JR, Greenlee MC, Klein I, <i>et al.</i> Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. <i>Thyroid</i> 2011;21:593–646.
B-E3	Hyperthyroid - monitoring of treatment in toxic multinodular goitre and toxic adenoma	<p>Followup in first 1–2 months after radioactive iodine treatment for toxic multinodular goitre and toxic adenoma should include fT4 and total T3 and TSH. Should be repeated at 1–2 month intervals until stable results, and then annually thereafter</p> <p>Following surgery for toxic multinodular goitre and start of thyroxine therapy, TSH should be measured 1–2 monthly until stable and annually thereafter</p> <p>Following surgery for toxic adenoma TSH and fT4 concentrations should be measured 4–6 weeks post-op</p>	Bahn Chair RS, Burch HB, Cooper DS, Garber JR, Greenlee MC, Klein I <i>et al.</i> Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. <i>Thyroid</i> 2011;21:593–646.
B-E4	UK Thyroid guidelines	TFTs should be performed every 4–6 weeks for at least 6 months following radioiodine treatment. Once fT4 remains in ref range then frequency of testing should be reduced to annually. Life-long annual follow up is required	Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. UK guidelines for the use of thyroid function tests. London: Association for Clinical Biochemistry, British Thyroid Association, 2006.

REF	Clinical situation	Recommendation	Source
		<p>Indefinite surveillance required following radioiodine or thyroidectomy for the development of hypothyroidism or recurrence of hyperthyroidism. TFTs should be assessed 4–8 weeks post treatment then 3 monthly for up to one 1 year, then annually thereafter</p> <p>TFTs should be performed every 4–6 weeks after commencing thionamides. Testing at 3 month intervals is recommended once maintenance dose achieved</p> <p>In patients treated with 'block and replace', assess TSH and T4 at 4–6 week intervals, then after a further 3 months once maintenance dose achieved, and then 6 monthly thereafter</p>	
B-E5	Hypothyroidism - monitoring treatment	<p>The minimum period to achieve stable concentrations after a change of dose of thyroxine is 2 months and TFTs should not normally be assessed before this period has elapsed</p> <p>Patients stabilised on long-term thyroxine therapy should have serum TSH checked annually.</p> <p>An annual fT4 should be performed in all patients with secondary hypothyroidism stabilised on thyroxine therapy</p>	<p>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. <i>UK guidelines for the use of thyroid function tests</i>. London: Association for Clinical Biochemistry, British Thyroid Association, 2006.</p>

REF	Clinical situation	Recommendation	Source
B-E6	Monitoring Adult sub-clinical hyperthyroidism	<p>If a serum TSH below ref range but >0.1 mIU/L is found, then the measurement should be repeated 1–2 months later along with T4 and T3 after excluding non-thyroidal illness and drug interferences. This is contradicted later in the guidelines when the authors state that a 3–6 month repeat interval is appropriate unless the patient is elderly or has underlying vascular disease</p> <p>If treatment not undertaken then serum TSH should be measured in the long term every 6–12 months, with follow up with fT4 and fT3 and fT3 if serum TSH result is low</p>	Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. <i>UK guidelines for the use of thyroid function tests</i> . London: Association for Clinical Biochemistry, British Thyroid Association, 2006.
B-E7	Monitoring adult sub-clinical hypothyroidism.	<p>Patients with subclinical hypothyroidism should have the pattern confirmed within 3–6 months to exclude transient causes of elevated TSH</p> <p>Subjects with subclinical hypothyroidism who are ATPOab positive should have TSH and fT4 checked annually</p> <p>Subjects with subclinical hypothyroidism who are ATPOab neg should have TSH and fT4 checked every 3 years</p>	Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. <i>UK guidelines for the use of thyroid function tests</i> . London: Association for Clinical Biochemistry, British Thyroid Association, 2006.
B-E8	Follow up of patients who have had differentiated (papillary and follicular) thyroid carcinoma and a total thyroidectomy and ¹³¹ I ablation	TSH and fT4 should be measured as dose of levothyroxine increased (every 6 weeks) until the serum TSH is <0.1 mIU/L. Thereafter annually unless clinically indicated/pregnant	British Thyroid Association, Royal College of Physicians. <i>Guidelines for the management of thyroid cancer (Perros P ed) 2nd edition</i> . Report of the Thyroid Cancer Guidelines Update Group. London: Royal College of Physicians, 2007

REF	Clinical situation	Recommendation	Source
		Samples for thyroglobulin (Tg) should not be collected sooner than 6 weeks post-thyroidectomy or ¹³¹ I ablation/therapy. TSH, fT4/fT3 (whichever is being supplemented) and Tg autoantibodies (TgAb) should be requested when Tg is measured. If TgAb are detectable, measurement should be repeated every 6 months	
B-E9	Follow up of patients who have had medullary thyroid cancer and surgical resection	<p>A baseline CEA and fasting calcitonin should be taken prior to operation. Postoperative samples should be measured no earlier than 10 days after thyroidectomy and plasma calcitonin concentrations are most informative 6 months after surgery</p> <p>At least 4 measurements of calcitonin over a 2–3 year period can be taken to provide an accurate estimate of the calcitonin doubling time. CEA is elevated in approximately 30% of MTC patients, and in those patients CEA doubling time is comparably informative to calcitonin doubling time</p> <p>Calcitonin monitoring should continue lifelong</p> <p>TFTs should be measured as per guidance for hypothyroidism</p>	<p>British Thyroid Association, Royal College of Physicians. <i>Guidelines for the management of thyroid cancer (Perros P, ed) 2nd edition</i>. Report of the Thyroid Cancer Guidelines Update Group. London: Royal College of Physicians, 2007.</p> <p>Giraudet <i>al</i>, Al Ghulzan A, Aupérin A, Leboulleux S, Chehboun A, Troalen F <i>et al</i>. Progression of medullary thyroid carcinoma: assessment with calcitonin and carcinoembryonic antigen doubling times. <i>Eur J Endocrinol</i> 2008;158: 239–246.</p>
B-E10	Anaplastic thyroid cancer	There is no need for any monitoring of thyroid function unless patient is on thyroid replacement, then as per hypothyroidism	British Thyroid Association, Royal College of Physicians. <i>Guidelines for the management of thyroid cancer (Perros P, ed) 2nd edition</i> . Report of the Thyroid Cancer Guidelines Update Group. London: Royal College of Physicians, 2007.
B-E11	Progesterone	Testing weekly in patients with irregular cycle from day 21 until next menstrual period	National Institute for Health and Care Excellence. <i>Fertility: assessment and treatment for people with fertility problems</i> . NICE, 2013. www.nice.org.uk/guidance/cg156

REF	Clinical situation	Recommendation	Source
B-E12	FSH	Two tests 4–8 weeks apart in women with possible early or premature menopause	Goodman NF, Cobin RH, Ginzburg SB, Katz IA, Woode DE. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the diagnosis and treatment of menopause. <i>Endocr Pract.</i> 2011;17(Suppl 6):1–25.
B-E13	Patients with suspected drug-induced hyperprolactinaemia	Discontinue medication for 3 days and remeasure prolactin	Casanueva FF, Molitch ME, Schlechte JA, Abs R, Bonert V, Bronstein MD <i>et al.</i> Guidelines of the Pituitary Society for the diagnosis and management of prolactinomas. <i>Clin Endocrinol (Oxf)</i> 2006;65:265–273. Melmed S, Casanueva FF, Hoffman AR, Kleinberg DL, Montori VM, Schlechte JA <i>et al.</i> Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline. <i>J Clin Endocrinol Metab</i> 2011;96:273–288.
B-E14	Patients with hyperprolactinaemia commencing dopamine agonist therapy	Repeat prolactin measurement after 1 month to guide therapy	Melmed S, Casanueva FF, Hoffman AR, Kleinberg DL, Montori VM, Schlechte JA <i>et al.</i> Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline. <i>J Clin Endocrinol Metab.</i> 2011;96:273–288.
B-E21	Screening for diabetes in asymptomatic patients: Adults < 45 y with normal weight and no risk factor Adults > 45 y with normal weight (BMI <25 kg/m ²) and no risk factor* Adults >18 y with BMI ≥25 kg/m ² and 1 risk factor*	Screening not recommended 3 years 3 years, if result is normal	American Diabetes Association. Clinical Practice Recommendations. <i>Diabetes care</i> 2012;35 (supplement 1). * Risk[s] factors listed in Table 4 of this document

REF	Clinical situation	Recommendation	Source
B-E22	Diagnosing diabetes using HbA _{1c} in an asymptomatic patient (not to be used in children or young adults)	Diagnosis should not be made on the basis of a single abnormal plasma glucose or HbA _{1c} value. At least one additional HbA _{1c} or plasma glucose test result with a value in the diabetic range is required within 2 weeks of the initial measurement, either fasting, from a random (casual) sample, or from the oral glucose tolerance test (OGTT)	World Health Organisation. <i>Use of Glycated Haemoglobin (HbA_{1c}) in the Diagnosis of Diabetes Mellitus - Abbreviated Report of a WHO Consultation</i> . Geneva: WHO, 2011. www.who.int/diabetes/publications/diagnosis_diabetes2011/en/
B-E23	HbA _{1c} monitoring of patients with type 2 diabetes	2–6 monthly intervals (tailored to individual needs), until the blood glucose concentration is stable on unchanging therapy; use a measurement made at an interval of less than 3 months as an indicator of direction of change, rather than as a new steady state Six monthly intervals once the blood glucose concentration and blood glucose lowering therapy are stable	National Institute for Health and Care Excellence. <i>Type 2 diabetes</i> . NICE, 2008. www.nice.org.uk/guidance/CG66/references
B-E15	Diagnosis of male androgen deficiency	Repeat testosterone measurement to confirm diagnosis recommended	Bhasin S, Cunningham GR, Hayes FJ, Matsumoto AM, Snyder PJ, Swerdloff RS <i>et al</i> . Testosterone Therapy in Adult Men with Androgen Deficiency Syndromes Endocrine Society Clinical Guideline. <i>J Clin Endocrinol Metab</i> 2010;95:2536–2559.
B-E16	Monitoring of patient with androgen deficiency on replacement therapy	Measure testosterone value 3 to 6 months after initiation of testosterone therapy Measure testosterone every 3–4 months for first year Measurement of prostate specific antigen (PSA) – Please refer to TM7	Bhasin S, Cunningham GR, Hayes FJ, Matsumoto AM, Snyder PJ, Swerdloff RS <i>et al</i> . Testosterone Therapy in Adult Men with Androgen Deficiency Syndromes Endocrine Society Clinical Guideline. <i>J Clin Endocrinol Metab</i> 2010;95:2536–2559. Petak SM, Nankin HR, Spark RF, Swerdloff RS, Rodriguez-Rigau LJ. American Association of Clinical Endocrinologists Medical Guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients—2002 update. <i>Endocr Pract</i> 2002;8:440–456.

REF	Clinical situation	Recommendation	Source
B-E17	Female androgen excess	If measurement found to be raised by an immunoassay method, confirm measurement with a LCMS method: thereafter 1 year	Martin KA1, Chang RJ, Ehrmann DA, Ibanez L, Lobo RA, Rosenfield RL <i>et al.</i> Evaluation and Treatment of Hirsutism in premenopausal women: an endocrine society clinical practice guideline. <i>J Clin Endocrinol Metab</i> 2008;93:1105–1120. Consensus opinion of the relevant expert working group
B-E18	Oestradiol	No evidence, guideline or consensus exists for repeat frequency For patients undergoing IVF samples may be taken daily For patients receiving implant treatment a pre-implant value is checked to avoid tachyphylaxis. Frequency depends on frequency of implant For patients receiving implant treatment a pre-implant value is checked to avoid tachyphylaxis	
B-E19	Growth hormone deficiency	IGF-1 is the most useful marker for monitoring and should be measured at least yearly. Assessment should be performed no sooner than 6 weeks following a dose change	Ho KK1; 2007 GH Deficiency Consensus Workshop Participants. Consensus guidelines for the diagnosis and treatment of adults with GH deficiency II: a statement of the GH Research Society in association with the European Society for Pediatric Endocrinology, Lawson Wilkins Society, European Society of Endocrinology, Japan Endocrine Society, and Endocrine Society of Australia. <i>Europ J Endocrinol</i> 2007;157:695–700.
B-E20	Acromegaly: Post surgery Medical therapy	Measure both GH and IGF-1 at 3 months. If normal then at annual follow up Measure both GH and IGF-1 at 3 months. If normal then at annual follow up	Growth Hormone Research Society, Pituitary Society. Biochemical assessment and long-term monitoring in patients with acromegaly: statement from a joint consensus conference of the Growth Hormone Research Society and The Pituitary Society. <i>J Clin Endocrinol Metab</i> 2004;89:3099–3102.

REF	Clinical situation	Recommendation	Source
	<p>Medical therapy using GH receptor antagonists</p> <p>Postradiotherapy</p>	<p>Measure only IGF-1 at 6 monthly intervals after dose titration. Monthly monitoring of LFTs for first six months</p> <p>Measurement of GH and IGF-1 annually</p>	

3.6 Cardiac

REF	Clinical situation	Recommendation	Source
B-C1	Using troponin (general)	MRI largely dependent on the assay being used and the clinical scenario. MRIs should be implemented according to the local protocol used	
	Acute coronary syndrome (ACS)	High sensitivity troponin assays will usually require several samples – with a second sample within 3 hours of presentation, the sensitivity for Myocardial infarction approaches 100%	Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H <i>et al</i> . ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. <i>Eur Heart J</i> 2011; 32:2999–3054.
	Cardiac surgery	For standard troponin assays - If the first blood sample for troponin is not elevated, a second sample should be obtained after 6–9 hours, and sometimes a third sample after 12–24 hours is required	Thygesen K, Mair J, Katus H, Plebani M, Venge P, Collinson P <i>et al</i> . Recommendations for the use of cardiac troponin measurement in acute cardiac care. <i>Eur Heart J</i> 2010;31: 2197–2204.
	Renal failure	Single measurement at 24 hours post surgery gives best correlation with outcome. Serial samples justified if clinical condition worsens and/or new ECG changes to assess ACS	Croal BL, Hillis GS, Gibson PH, Fazal MT, El-Shafei H, Gibson G <i>et al</i> , The relationship between post-operative cardiac troponin I levels and outcome from cardiac surgery. <i>Circulation</i> 2006;114:1468–1475.
		Concentrations usually increased in chronic kidney disease (CKD) patients (especially using high sensitivity assays) – serial samples will be required if suspected ACS as above	Khan NA, Hemmelgarn BR, Tonelli M, Thompson CR, Levin A. Prognostic value of troponin T and I among asymptomatic patients with end-stage renal disease: a meta- analysis. <i>Circulation</i> 2005;112:3088–3096.
			Consensus opinion of the relevant expert working group
B-C2	Using BNP (NT-ProBNP) Primary care (heart failure triage)	Should only be measured once unless there is a repeat episode of suspected heart failure with a change in clinical presentation and the diagnosis of heart failure has previously been excluded. Single time point use adequate for NICE guidance purposes	National Institute for Health and Care Excellence. <i>Chronic heart failure: Management of chronic heart failure in adults in primary and secondary care</i> . NICE, 2010. www.nice.org.uk/guidance/CG108

REF	Clinical situation	Recommendation	Source
B-C2	<p>Secondary care (acute 'short of breath' triage)</p> <p>Therapeutic guidance in heart failure</p>	<p>Should only be measured once per acute episode for diagnosis. Pre-discharge repeat measurement has prognostic significance but has not been shown to alter outcome</p> <p>Not yet accepted in guidelines</p>	<p>Consensus opinion of the relevant expert working group</p> <p>National Institute for Health and Care Excellence. <i>Chronic heart failure: Management of chronic heart failure in adults in primary and secondary care</i>. NICE, 2010. www.nice.org.uk/guidance/CG108</p>

3.7 Gastrointestinal

REF	Clinical situation	Recommendation	Source
B-G1	Coeliac serology in known adult patients on follow up	IgA tTG can be used to monitor response to a gluten-free diet. Retesting at 6–12 months depending on pre-treatment value	www.uptodate.com
B-G2	Faecal elastase	Minimum retesting interval 6 months	Molinari I, Souare K, Lamireau T, Fayon M, Lemieux C, Cassaigne A <i>et al.</i> Faecal chymotrypsin and elastase-1 determination on one single stool collected at random: diagnostic value for exocrine pancreatic status. <i>Clin Biochem</i> 2004;37:758–763.
B-G3	Faecal calprotectin	Minimum retesting interval 6 months	van Rheenen PF, Van de Vijver E, Fidler V. Faecal calprotectin for screening of patients with suspected inflammatory bowel disease: diagnostic meta-analysis. <i>BMJ</i> 2010;341:c3369.
B-G4	Trace elements (copper, zinc, selenium)	Baseline then every 2 to 4 weeks depending upon results	National Institute for Health and Care Excellence. <i>Nutrition support in adults: Oral nutrition support, enteral tube feeding and parenteral nutrition</i> . NICE, 2006. www.nice.org.uk/guidance/CG32
B-G5	Ferritin monitoring for haemochromatosis	EASL 2010 recommend retesting interval initially 3 months but test more frequently as ferritin approaches normal range. BCSH 2000 recommends monthly ferritin during venesection	European Association for the Study of the Liver. EASL Clinical Practice Guidelines for HFE Hemochromatosis. <i>J Hepatol</i> 2010;53:3–22. British Committee for Standards in Haematology. <i>Guidelines on diagnosis and therapy – Genetic Haemochromatosis</i> . London: British Committee for Standards in Haematology, 2000.
B-G6	Iron deficiency diagnosis	Repeat measurement not required unless doubt regarding diagnosis	Goddard AF, James MW, McIntyre AS, Scott BB; British Society of Gastroenterology. Guidelines for the management of iron deficiency anaemia. <i>Gut</i> 2011;60:1309–1316.
B-G7	Iron profile/ferritin in patients on parenteral nutrition	Minimum retesting interval 3–6 months	National Institute for Health and Care Excellence Clinical Guideline. <i>Nutrition support in adults: Oral nutrition support, enteral tube feeding and parenteral nutrition</i> . NICE, 2006. www.nice.org.uk/guidance/CG32

REF	Clinical situation	Recommendation	Source
B-G8	Iron status in chronic kidney disease	Monitor iron status no earlier than 1 week after receiving I.V. iron and at intervals of 4 weeks to 3 months routinely	National Institute for Health and Care Excellence Clinical Guideline. <i>Anaemia management in people with chronic kidney disease</i> . NICE, 2011. www.nice.org.uk/guidance/CG114
B-G9	Iron profile/ferritin in a normal patient	Minimum retesting interval 1 year	National Institute for Health and Care Excellence Clinical Guideline. <i>Nutrition support in adults: Oral nutrition support, enteral tube feeding and parenteral nutrition</i> . NICE, 2006. www.nice.org.uk/guidance/CG32 Smellie WS, Forth J, Bareford D, Twomey P, Galloway MJ, Logan EC <i>et al</i> . Best practice in primary care pathology: review 3. <i>J Clin Pathol</i> 2006;59:781–789.
B-G10	Monitoring vitamin B12 and folate deficiency	Repeat measurement of vitamin B12 and folate is unnecessary in patients with vitamin B12 and folate deficiency	Clinical Knowledge Summary. <i>Anaemia – Vitamin B12 and Folate Deficiency</i> . National Institute for Health and Care Excellence, 2014. http://cks.nice.org.uk/anaemia-b12-and-folate-deficiency

For more guidance on the laboratory monitoring of patients on nutritional support, particularly parenteral nutrition and those receiving enteral or oral feeds who are metabolically unstable or at risk of refeeding syndrome, please refer to the NICE Clinical Guideline 32 - Nutrition support in adults.

3.8 Specific proteins

REF	Clinical situation	Recommendation	Source
B-SP1	Paraproteins	Testing at 3 months intervals initially	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58:1016–1024
B-SP2	Patients with no features of plasma cell dyscrasia (for example, anaemia, bone fracture or pain located in bone, suppression of other immunoglobulin classes, renal impairment) and a band of <15g/L	Annual serum protein electrophoresis and quantitation by densitometry without need for further immunofixation is recommended	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58:1016–1024.
B-SP3	Monoclonal gammopathy of undetermined significance	Annually	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58:1016–1024.
B-SP4	Immunoglobulins	Patients on immunoglobulin replacement therapy must have trough IgG concentrations and liver function tests performed at least quarterly	UK Primary Immunodeficiency Network. <i>Standards of Care: CVID diagnosis and management (version 2)</i> . Newcastle: UK Primary Immunodeficiency Network, 2011. www.ukpin.org.uk/home/standards/standards-CVID.pdf
B-SP5	Immunoglobulins	For other purposes, testing at minimum interval of 6 months is recommended	Consensus opinion of the relevant expert working group
B-SP6	Myeloma patients on active treatment	Local guidance and treatment regimes should be followed when requesting paraprotein concentrations for patients on active treatment	Consensus opinion of the relevant expert working group
B-SP7	C-Reactive protein (CRP)	Not within a 24 hour period following an initial request with the exception of paediatric requests	Hutton HD, Drummond HS, Fryer AA. The rise and fall of C-reactive protein: managing demand within clinical biochemistry. <i>Ann Clin Biochem</i> 2009;46:155–158.

REF	Clinical situation	Recommendation	Source
B-SP8	Procalcitonin	24 hour	<p>Hochreiter M, Köhler T, Schweiger AM, Keck FS, Bein B, von Spiegel T <i>et al.</i> Procalcitonin to guide duration of antibiotic therapy in intensive care patients: a randomized prospective controlled trial. <i>Crit Care</i> 2009;13:R83.</p> <p>Seguela PE, Joram N, Romefort B, Manteau C, Orsonneau JL, Branger B <i>et al.</i> Procalcitonin as a marker of bacterial infection in children undergoing cardiac surgery with cardiopulmonary bypass. <i>Cardiol Young</i> 2011;21:392–399.</p>

3.9 Tumour markers

REF	Clinical situation	Recommendation	Source
B- TM1	α -Fetoprotein for hepatocellular carcinoma (HCC) surveillance: screening patients at high HCC risk	6 months (UK)	Sturgeon CM, Duffy MJ, Hofmann BR, Lamerz R, Fritsche HA, Gaarenstroom K <i>et al.</i> National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines for use of tumor markers in liver, bladder, cervical, and gastric cancers. <i>Clin Chem.</i> 2010;56:e1–48.
B-TM2	α -Fetoprotein for monitoring disease recurrence in HCC	3–6 months	Sturgeon CM, Duffy MJ, Hofmann BR, Lamerz R, Fritsche HA, Gaarenstroom K <i>et al.</i> National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines for use of tumor markers in liver, bladder, cervical, and gastric cancers. <i>Clin Chem.</i> 2010;56:e1–48.
B-TM3	Screening women with family history of ovarian cancer with CA125	12 months	Sturgeon CM, Duffy MJ, Stenman UH, Lilja H, Br�nner N, Chan DW <i>et al.</i> National Academy of Clinical Biochemistry laboratory medicine practice guidelines for use of tumor markers in testicular, prostate, colorectal, breast, and ovarian cancers. <i>Clin Chem.</i> 2008;54:e11–79.
B-TM4	Using CA125 in diagnostic strategies	Retesting CA125 where imaging is negative within 1 month	National Institute for Health and Care Excellence Clinical Guideline. <i>Ovarian cancer: The recognition and initial management of ovarian cancer.</i> NICE, 2011. www.nice.org.uk/guidance/C/G122
B-TM5	Monitoring CA125 in disease recurrence	1 month	Sturgeon CM, Duffy MJ, Stenman UH, Lilja H, Br�nner N, Chan DW <i>et al.</i> National Academy of Clinical Biochemistry laboratory medicine practice guidelines for use of tumor markers in testicular, prostate, colorectal, breast, and ovarian cancers. <i>Clin Chem.</i> 2008;54:e11–79.
B-TM7	Monitoring disease recurrence with CA199	1 month	No available evidence. All Wales Consensus Group

REF	Clinical situation	Recommendation	Source
B-TM8	PSA screening	When first result is raised, repeat once in 6 weeks to assess the trend	Prostate Cancer Risk management programme www.cancerscreening.nhs.uk/prostate/index.html
B-TM9	Monitoring disease with PSA	Every 3 months for first 1–2 years. Every 6 months for 2 years. Annually thereafter	Smellie WS, Forth J, Sundar S, Kalu E, McNulty CA, Sherriff E <i>et al.</i> Best practice in primary care pathology: review 4. <i>J Clin Pathol.</i> 2006;59;1116.
B-TM10	Monitoring disease recurrence with CA15.3	2 months	Molina R, Barak V, van Dalen A, Duffy MJ, Einarsson R, Gion M <i>et al.</i> Tumor markers in breast cancer- European Group on Tumor Markers recommendations. <i>Tumour Biol.</i> 2005;26;281–293.
B-TM11	Serum β -HCG (tumour marker)	After evacuation of a molar pregnancy, the hCG concentration should be monitored every week until normalisation and then every month during the first year	Bidart JM, Thuillier F, Augereau C, Chalas J, Daver A, Jacob N <i>et al.</i> Kinetics of Serum Tumour Marker Concentrations and Usefulness in Clinical Monitoring. <i>Clin Chem.</i> 1999;45:1695–1707.
B-TM12	Serum β -HCG (tumour marker)	After resection, prolonged marker half-life (>3 days for hCG) is a reliable indicator of residual tumour and a significant predictor of survival	
B-TM13	Serum β -HCG (tumour marker)	If rate of change in tumour marker concentration changes velocity, an urgent repeat to confirm the result is reasonable	Sturgeon CM, Hoffman BR, Chan DW, Ch'ng SL, Hammond E, Hayes DF <i>et al.</i> National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines use of tumour markers in clinical practice: quality requirements. <i>Clin Chem.</i> 2008;54:1935–1939.

3.10 Therapeutic drug monitoring

As drugs are xenobiotics, the time for significant change is based on the kinetics of absorption and clearance. Steady state concentrations on new dose regimens are normally established after five plasma half-lives have elapsed.

For drugs where over 30% of clearance is renal then dosing and half-life are reflected by the creatinine clearance calculated using the Cockcroft & Gault formula (eGFR is less reliable though widely used). Tables of half-lives for most drugs are given and referenced in Brunton *et al.*⁶

Some drugs induce their own metabolism, e.g. carbamazepine or can have hepatic clearance induced by another drug. Specific details need to be checked with the literature. Other xenobiotic interactions may significantly affect half-lives e.g. smoking and clozapine.

Depending on the metabolic pathway an individual's pharmacogenetic phenotype may result in more rapid or much slower metabolism than the general population, so the half-lives will be shorter or longer respectively and the 5 half-life rule applies, but using a half-life specific to the individual.

As there are so many different combinations of interaction the advice given above is a general guide and the specific classes discussed below are for high-level guidance.

REF	Clinical situation	Recommendation	Source
B-TD1	Anticonvulsant drugs (carbamazepine, phenytoin)	Five half-lives after dosage change (4–5 days) during initial dose optimisation, unless toxicity is suspected . The kinetics of phenytoin are highly variable between individuals and when metabolism is saturated, a small dose change results in a disproportionate increase in plasma concentration. There is a significant risk of overdose and therefore when titrating dose changes check up to every 12 hours depending on clinical condition and therapy. This will be more frequent on iv therapy for status epilepticus. Note: carbamazepine induces its own metabolism and concentrations should be confirmed 2–3 months after commencing therapy	Consensus opinion of the relevant expert working group

REF	Clinical situation	Recommendation	Source
B-TD2	Digoxin	Five half-lives after dosage change (i.e. approx. 7 days) during initial dose optimisation, unless toxicity is suspected. When renal function has changed significantly recognise the proportionate decrease in clearance. In overdose situations, up to every 4 hours depending on clinical condition and therapy	Consensus opinion of the relevant expert working group.
B-TD3	Aminoglycoside antibiotics (gentamicin, tobramycin)	Every 24 hours at start of therapy on high-dose parenteral regimes, less frequently when stable. Especially important in the elderly, patients with impaired renal function and those with cystic fibrosis	Consult local hospital guidelines
B-TD4	Immunosuppressive drugs (ciclosporin, tacrolimus, sirolimus)	Initially 3x per week after transplantation, less frequently when stable. Concentrations should also be checked when any medication with possible interactions is prescribed, the dosage is changed, the formulation is changed or when there is unexplained graft dysfunction	Baker R, Jardine A, Andrews P. <i>Post-operative Care of the Kidney Transplant Recipient</i> . Hampshire: The Renal Association, 2011
B-TD5	Theophylline	Five half-lives after dosage change (i.e. approx. 2 days) during initial dose optimisation on oral regimes. Note smoking significantly reduces the half-life. Daily on IV aminophylline. In overdose situations requiring haemodialysis, every 4 hours	Consensus opinion of the relevant expert working group.
B-TD6	Methotrexate (high dose IV)	24 hours after completion of therapy then every 24 hours until plasma methotrexate is below cut-off concentration for toxicity (1 µmol/L at 48 hr or according to local protocol)	See product literature

REF	Clinical situation	Recommendation	Source
B-TD7	Lithium	Days 4–7 of treatment then every week until dosage has remained constant for 4 weeks, then every 3 months on stabilised regimes. Check concentration when preparation changed, when fluid intake changes or when interacting drugs are added/withdrawn. 100% renal clearance, so dependant on renal function. Up to every 4 hours in overdose situations requiring intensive therapy	British Medical Association, Royal Pharmaceutical Society of Great Britain, Edited by Joint Formulary Committee. <i>British National Formulary</i> (BNF) March 2012. London: Pharmaceutical Press, 2012.
B-TD 8	Clozapine	Induces its own metabolism and is induced further by smoking. Approximately 4 days to reach new steady-state after dose change or smoking cessation with potentially fatal consequences due to the rapid increase to toxic concentrations	Consensus opinion of the relevant expert working group

3.11 Occupational / toxicology

REF	Clinical situation	Recommendation	Source
B-O1	Occupational lead exposure (chronic)	<p>Initial blood lead concentration before commencing work or within 14 days of starting</p> <p>Blood lead concentration monitoring performed at least every 12 months unless significantly exposed to metallic lead and its compounds, in which case the blood lead should be measured every three months</p> <p>If the blood lead is ≥ 30 $\mu\text{g/dL}$ in adult males (≥ 20 $\mu\text{g/dL}$ in women of child bearing age) monitor at least every 6 months</p> <p>If the blood lead is ≥ 40 $\mu\text{g/dL}$ in adult males (≥ 25 $\mu\text{g/dL}$ in women of child bearing age) monitor at least every 3 months</p> <p>If the blood lead is ≥ 60 $\mu\text{g/dL}$ in adult males (≥ 30 $\mu\text{g/dL}$ in women of child bearing age) repeat measurement of blood lead within 2 weeks</p>	Health and Safety Executive. <i>Control of lead at work 3rd edition</i> . HSE Books, 2002.
B-O2	Acute lead poisoning in adults	<p>If baseline blood lead concentration is < 50 $\mu\text{g/dL}$, the patient is asymptomatic and not pregnant, repeat blood lead concentration after 2 weeks following removal from exposure</p> <p>If baseline blood lead concentration is ≥ 50 $\mu\text{g/dL}$, monitor blood lead concentrations daily during chelation therapy and measure 24 hour urine lead excretion to assist in deciding the duration of treatment. Repeat the blood lead measurement 1 week after the end of chelation treatment</p>	TOXBASE www.toxbase.org

REF	Clinical situation	Recommendation	Source
B-O3	Acute lead poisoning in children	<p>If the baseline blood lead concentration is between 10–50 µg/dL then repeat blood lead measurement in one month following removal from exposure</p> <p>If baseline blood lead concentration is >50 µg/dL, monitor blood lead daily during chelation therapy and measure 24 hour urine lead excretion to assist in deciding the duration of therapy. Repeat the blood lead measurement 1 week after the end of treatment</p>	<p>TOXBASE www.toxbase.org</p>
B-O4	Amphetamine toxicity	Retesting is not indicated in the same acute episode	Consensus opinion of the relevant expert working group
B-O5	Benzodiazepine toxicity	Retesting is not indicated in the same acute episode	Consensus opinion of the relevant expert working group
B-O6	Cocaine toxicity	Retesting is not indicated in the same acute episode	Consensus opinion of the relevant expert working group
B-O7	Opiate toxicity including morphine, codeine and heroin	Retesting is not indicated in the same acute episode	Consensus opinion of the relevant expert working group
B-O8	Opioid toxicity including methadone	Retesting is not indicated in the same acute episode	Consensus opinion of the relevant expert working group

3.12 Pregnancy related

REF	Clinical situation	Recommendation	Source
B-P1	Urine β HCG (pregnancy)	Urine pregnancy test can be repeated at 3 days after a negative result or approx. 28 days after period commences	Manufacturer's instructions
B-P2	Serum β HCG (pregnancy)	Serum β HCG test: do not repeat if positive. Repeat after 3 days if negative and no menstrual period has occurred	Serum HCG doubling time = 1.5–2 days
B-P3	Serum β HCG (ectopic pregnancy)	48 hour repeat interval	Mol BW, van Der Veen F, Bossuyt PM. Implementation of probabilistic decision rule improves the predictive values in algorithms in the diagnostic management of ectopic pregnancy. <i>Hum Reprod</i> 1999;14: 2855–2262.
B-P4	Serum β HCG (tumour marker)	After evacuation of a molar pregnancy, the β hCG concentration should be monitored every week until normalisation and then every month during the first year	Bidart JM, Thuillier F, Augereau C, Chalas J, Daver A, Jacob N <i>et al</i> . Kinetics of serum tumor marker concentrations and usefulness in clinical monitoring. <i>Clin Chem</i> 1999;45:1695–1707.
B-P5	LFTs in obstetric cholestasis	Once obstetric cholestasis is diagnosed, it is reasonable to measure LFTs weekly until delivery. Postnatally, LFTs should be deferred for at least 10 days	Royal College of Obstetricians and Gynaecologists. <i>Obstetric Cholestasis: Green-top Guideline No. 43</i> . London: Royal College of Obstetricians and Gynaecologists, 2011.
B-P6	Women with persistent pruritus and normal biochemistry	LFTs repeated every 1–2 weeks	Royal College of Obstetricians and Gynaecologists. <i>Obstetric Cholestasis: Green-top Guideline No. 43</i> . London: Royal College of Obstetricians and Gynaecologists, 2011.
B-P7	Bile acids in obstetric cholestasis	Weekly monitoring. Twice weekly monitoring advised in later weeks if clinical state changing	No evidence available but reflects expert opinion and practice
B-P8	Measurement of urate in pre-eclampsia	Awaiting expert advice whilst not admitted: twice weekly urate	No evidence but reflects the practice of tertiary centre of excellent.

REF	Clinical situation	Recommendation	Source
B-P9	Urine protein in pre-eclampsia	At each antenatal visit to screen for pre-eclampsia. Once diagnosed do not repeat quantification of proteinuria. However, daily urine protein recommended in severe hypertension	National Institute for Health and Care Excellence Clinical Guideline. <i>Antenatal care</i> . NICE, 2008. https://www.nice.org.uk/guidance/cg62 National Institute for Health and Care Excellence Clinical Guideline. <i>Hypertension in pregnancy: The management of hypertensive disorders during pregnancy</i> . NICE, 2010. https://www.nice.org.uk/guidance/cg107
B-P10	LFT/renal in pre-eclampsia	At least daily when the results are abnormal but more often if the clinical condition If mild hypertension* then perform tests twice weekly. If moderate hypertension* then perform tests three times a week If severe hypertension* then perform tests three times a week * See source guidelines for definitions of hypertension	Royal College of Obstetricians and Gynaecologists. <i>Severe Pre-eclampsia/ Eclampsia, Management: Green-top Guideline No. 10A</i> . London: Royal College of Obstetricians and Gynaecologists, 2006. National Institute for Health and Care Excellence Clinical Guideline. <i>Hypertension in pregnancy: The management of hypertensive disorders during pregnancy</i> . NICE, 2010. https://www.nice.org.uk/guidance/cg107
B- P11	Pregnant women - monitoring of thyrotoxicosis treatment (UK)	In women taking anti-thyroid drugs TFTs should be performed prior to conception, at time of diagnosis of pregnancy or at antenatal booking Newly diagnosed hyperthyroid patients require monthly testing during pregnancy until stabilised. Pregnant women receiving anti-thyroid drugs should be tested frequently (perhaps monthly)	Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. <i>UK guidelines for the use of thyroid function tests</i> . London: Association for Clinical Biochemistry, British Thyroid Association, 2006.
B-P12	Pregnant women - monitoring thyrotoxicosis treatment (USA)	It is recommend that women treated with anti-thyroid drugs in pregnancy, fT4 and TSH should be monitored approximately every 2–6 weeks	Stagnaro-Green A, Abalovich M, Alexander E, Azizi F, Mestman J, Negro R, <i>et al</i> . Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. <i>Thyroid</i> 2011;21:1081–1125.

REF	Clinical situation	Recommendation	Source
B-P13	Pregnant women - monitoring thyroxine replacement therapy	<p>Both TSH and fT4 (and fT3 if TSH below detection limit) should be measured to assess thyroid status and monitor thyroxine therapy in pregnancy</p> <p>The thyroid status of hypothyroid patients should be checked with TSH and fT4 during each trimester. Measurement of T3 is not appropriate</p> <p>The following TFT test sequence is recommended by the UK guidelines [ii]:</p> <ul style="list-style-type: none"> • before conception • at time of diagnosis of pregnancy • at antenatal booking • at least once in second and third trimesters and again after delivery • newly diagnosed hypothyroid patient to be tested every 4–6 weeks until stabilised 	<p>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. <i>UK guidelines for the use of thyroid function tests</i>. London: Association for Clinical Biochemistry, British Thyroid Association, 2006.</p>
B- P14	Pregnancy sub-clinical hypothyroidism	<p>Women with subclinical hypothyroidism who are not initially treated should be monitored for progression to overt hypothyroidism with serum fT4 and TSH every 4 weeks until 16–20 weeks gestation and at least once between 26–32 weeks</p> <p>(Euthyroid women (not receiving LT4) who are antithyroid antibody positive should be monitored during pregnancy - with serum fT4 and TSH every 4 weeks until 16–20 weeks gestation and at least once between 26–32 weeks)</p>	<p>Stagnaro-Greenet A, Abalovich M, Alexander E, Azizi F, Mestman J, Negro R, <i>et al</i>. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. <i>Thyroid</i>. 2011;21:1081–1125.</p>

REF	Clinical situation	Recommendation	Source
B-P15	Women with diabetes who are planning to become pregnant	Monthly measurement of HbA _{1c}	National Institute for Health and Care Excellence Clinical Guideline. Diabetes in pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period. NICE, 2008. https://www.nice.org.uk/guidance/cg63
B- P16	Assessing glycaemic control using HbA _{1c} in pregnancy	HbA _{1c} should not be used routinely for assessing glycaemic control in the second and third trimesters of pregnancy	National Institute for Health and Care Excellence Clinical Guideline. Diabetes in pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period. NICE, 2008. https://www.nice.org.uk/guidance/cg63

3.13 Paediatric related

REF	Clinical situation	Recommendation	Source
B-CH1	HbA _{1c} monitoring in children and young people with type 1 diabetes	2 months	National Institute for Health and Care Excellence. <i>Type 1 diabetes: Diagnosis and management of type 1 diabetes in children and young people</i> . NICE, 2004. www.nice.org.uk/guidance/CG15
B-CH2	Coeliac serology in known paediatric patients on follow up	Testing at 6 months in children	Murch S, Jenkins H, Auth M, Bremner R, Butt a, France S <i>et al</i> . Joint BSPGHAN and Coeliac UK guidelines for the diagnosis and management of coeliac disease in children. <i>Arch Dis Child</i> 2013;98:806–811.

4 Haematology recommendations

4.1 Haematology general

REF	Clinical situation	Recommendation	Source
Full blood count (FBC). Refers to the measurement of Hb, WCC and Plt count unless otherwise stated.			
H-FBC1	Normal follow up	A repeat would be indicated on clinical grounds if there were a significant change in that patients condition	Consensus of the haematology working group
H-FBC2	Inpatient monitoring of a stable patient	An inpatient with a normal admission FBC should not have a repeat within the average length of stay of 4 days	Consensus of the haematology working group
H-FBC3	Inpatient monitoring of an unstable patient who is not actively bleeding or a patient receiving cytotoxic drugs	Not usually required more than once daily	Consensus of the haematology working group
H-FBC4	Patients with major bleeding	Repeat interval should be determined by the clinical situation. Should be repeated at least every hour in massive haemorrhage	Association of Anaesthetists of Great Britain and Ireland, Thomas D, Wee M, Clyburn P, Walker I, Brohi K <i>et al.</i> Blood transfusion and the anaesthetist: management of massive haemorrhage. <i>Anaesthesia</i> 2010;65:1153–1161.
H-FBC5	Outpatient on haematinic supplements (iron, folate, B12)	Repeat after at least 14 days	British Committee for Standards in Haematology. <i>UK Guidelines on the management of iron deficiency in pregnancy</i> . London: BCSH, 2011
H-FBC6	Routine pregnancy monitoring	At booking, 28 weeks and postpartum	National Institute for Health and Care Excellence. Antenatal care. NICE, 2008. www.nice.org.uk/guidance/cg62 British Committee for Standards in Haematology. <i>UK Guidelines on the management of iron deficiency in pregnancy</i> . London: BCSH, 2011.
H-FBC7	Immune thrombocytopenia in pregnancy	Every 4 weeks and then every 2 weeks after 28 weeks	British Committee for Standards in Haematology. <i>UK Guidelines on the management of iron deficiency in pregnancy</i> . London: BCSH, 2011.

REF	Clinical situation	Recommendation	Source
H-FBC8	Hypertensive disorders of pregnancy* *FBC in combination with renal and liver function	Once only if moderate antenatal gestational hypertension (<160/110) without proteinuria. Weekly if severe gestational hypertension. Twice weekly if mild antenatal hypertension with pre-eclampsia, three times weekly if moderate to severe. As clinically indicated in peripartum period (may require multiple repeats over 24 hours) and then repeat 48 hours after delivery/step down from critical care and stop monitoring if normal values	National Institute for Health and Care Excellence. Clinical Guideline. <i>Hypertension in pregnancy: The management of hypertensive disorders during pregnancy</i> . NICE, 2010. www.nice.org.uk/guidance/CG107
H-FBC9	Inpatients with suspected platelet <i>allo</i> antibodies or receiving HLA matched platelets	A repeat 1 hour after completion of platelet transfusion	
H-FBC10	Patients with anaemia of chronic kidney disease	Every 2–4 weeks in the induction phase of ESA therapy and every 1–3 months in the maintenance phase of ESA therapy	National Institute for Health and Care Excellence. Clinical Guideline. <i>Anaemia management in people with chronic kidney disease</i> . NICE, 2011. www.nice.org.uk/guidance/CG114
Erythrocyte Sedimentation Rate (ESR)			
H-ESR1	Temporal arteritis/polymyalgia rheumatica	Every 3 months following first month of treatment	Dasgupta B, Borg FA, Hassan N, Barraclough K, Bourke B, Fulcher J <i>et al</i> . BSR and BHRP guidelines for the management of polymyalgia rheumatica. <i>Rheumatology (Oxford)</i> . 2010;49:186–190.
H-ESR2	Rheumatoid arthritis	Every month until treatment has controlled the disease (NICE CG79 recommends use of CRP)	NICE Clinical Guideline. Rheumatoid arthritis: The management of rheumatoid arthritis in adults. National Institute for Health and Care Excellence, 2009. http://www.nice.org.uk/guidance/CG79

4.2 Haematology coagulation

Basic clotting screen (CS) refers to the combined measurement of PT and APTT unless otherwise stated.

REF	Clinical situation	Recommendation	Source
H-CS1	Patients with major bleeding	Repeat interval should be determined by the clinical situation. Should be repeated at least every hour in massive haemorrhage	Association of Anaesthetists of Great Britain and Ireland, Thomas D, Wee M, Clyburn P, Walker I, Brohi K <i>et al.</i> Blood transfusion and the anaesthetist: management of massive haemorrhage. <i>Anaesthesia</i> 2010;65:1153–1161.
H-CS2	Patients with acute coagulopathy	Usually no more than daily if not receiving coagulation factors and no active bleeding	Consensus of the haematology working group
Prothrombin time (PT) expressed as time in seconds or as a ratio with normal			
H-PT1	Patients with chronic liver disease	Every 3 months if otherwise stable	Consensus of the haematology working group
International Normalised Ratio (INR)			
H-INR1	Patients being initiated on vitamin K antagonist (VKA)	No more than once daily	Consensus of the haematology working group
H-INR2	Unstable inpatient on VKA	No more than once daily	Consensus of the haematology working group
H-INR3	Stable outpatient on VKA	Usually no more than once weekly and up to 12 weeks when very stable	Consensus of the haematology working group
H-INR4	Patient requiring urgent reversal of VKA (or to treat any acquired deficiency of vitamin K dependent coagulation factors) with vitamin K	Repeat only after at least 6 hours following IV dose and the following day after an oral dose	Consensus of the haematology working group
H-INR5	Patient requiring urgent reversal of VKA with a 4 factor PCC	Repeat within an hour of administration	Consensus of the haematology working group

REF	Clinical situation	Recommendation	Source
Activated partial thromboplastin time (APTT) expressed as time in seconds and/or as a ratio with normal			
H-APTT1	Patient receiving intravenous infusion of unfractionated heparin	Repeat 6 hours after dose adjustment (2 hours if previous APTT ratio >5.0) and daily when APTT in the target range	Raschke RA, Reilly BM, Guidry JR, Fontana JR, Srinivas S. The weight-based heparin dosing nomogram compared with a "standard care" nomogram. <i>Ann Intern Med</i> 1993;119:874–881.
H-APTT2	Patients receiving intravenous infusion of a parenteral direct thrombin inhibitor (Bivalirudin, Argatroban)	Repeat 2 hours after each dose adjustment then daily when in the target range	Summary of Product Characteristics
Clauss fibrinogen assay			
H-F1	Patients with acute coagulopathy	Usually no more than daily if not receiving coagulation factors and no active bleeding	Consensus of the haematology working group
H-F2	Patients with major bleeding	Repeat interval should be determined by the clinical situation. Should be repeated at least every hour in massive haemorrhage	Association of Anaesthetists of Great Britain and Ireland, Thomas D, Wee M, Clyburn P, Walker I, Brohi K <i>et al.</i> Blood transfusion and the anaesthetist: management of massive haemorrhage. <i>Anaesthesia</i> 2010;65:1153–1161.
Anti-Xa assay			
H-Anti-Xa1	Patient on therapeutic dose of LMWH with significant renal impairment, extreme weight, pregnancy or other indication for measurement	At least 3 days after initiation or dose adjustment then no more than once weekly if the dose is unchanged	Consensus of the haematology working group
Lupus anticoagulant screen (LA)			
H-LA1	Investigation of suspected antiphospholipid syndrome	Repeat after 12 weeks if abnormal	Keeling D, Mackie I, Moore GW, Greer IA, Greaves M; British Committee for Standards in Haematology. Guidelines on the investigation and management of Antiphospholipid Syndrome. <i>Br J Haematol</i> 2012;157:47–58.

REF	Clinical situation	Recommendation	Source
H-LA2	Investigation for antiphospholipid syndrome after completion of anticoagulation	At least 7 days after stopping anticoagulation	
Coagulation factor assay (CFA). Refers to the measurement of antigen and/or activity of a coagulation factor (procoagulant or anticoagulant)			
H-CF1	A patient under investigation for suspected coagulation factor deficiency	An abnormal result can be repeated for confirmation at a clinically appropriate interval	Consensus of the haematology working group
H-CF2	A patient receiving coagulation factor replacement therapy	An assay immediately before and up to 60 minutes after administration and then as clinically indicated, usually no more than once daily (either trough, peak or both)	Consensus of the haematology working group
Coagulation factor inhibitor testing including the use of a Bethesda assay or equivalent, other inhibitor screens, ELISA or trough factor measurement			
H-CFI1	Surveillance in patients with severe haemophilia A or B	After every 3rd factor exposure day (ED) or every 3 months (whichever is sooner) until 20 ED then every 3–6 months until 150 ED (then 1–2 times per year in severe Haemophilia A only)	Collins PW, Chalmers E, Hart DP, Liesner R, Rangarajan S, Talks K <i>et al.</i> Diagnosis and treatment of factor VIII and IX inhibitors in congenital haemophilia: (4 th ed). UK Haemophilia Centre Doctors Organization. <i>Br J Haematol</i> 2013;160:153–170.
H-CFI2	Surveillance after change of factor concentrate in severe Haemophilia A	Before the change and then twice in the first 6 months after the change	
H-CFI3	Surveillance in patients with moderate or mild haemophilia A	Annually if exposed to factor concentrate or after intensive exposure (>5ED) or surgery	
H-CFI3	Monitoring of Immune Tolerance Therapy (ITT) during treatment	Monthly	
H-CFI4	After completion of successful ITT	Monthly for 6 months then every 2 months for up to a year	
H-CFI5	Monitoring patients with newly diagnosed acquired coagulation factor inhibitor	Monthly until 6 months after remission	Consensus of haematology working group W Collins P, Chalmers E, Hart D, Jennings I, Liesner R, Rangarajan S <i>et al.</i> Diagnosis and management of acquired coagulation inhibitors: a guideline from UKHCDO. <i>Br J Haematol</i> 2013;162: 758–773.

4.3 Haematology transfusion (general and screening group in PBLC)

REF	Clinical situation	Recommendation	Source
Blood group and antibody screen			
H-BGAS1	A first time patient prior to transfusion	A second sample can be requested prior to the planned procedure/transfusion	British Committee for Standards in Haematology, Milkins C, Berryman J, Cantwell C, Elliott C, Haggas R <i>et al.</i> Guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories. British Committee for Standards in Haematology. <i>Transfus Med</i> 2013;23:3–35.
H-BGAS2	A patient who has not had a transfusion or pregnancy within the previous 3 months	The original sample can be valid for up to 3 months	
H-BGAS3	A patient who has had a transfusion or pregnancy within the previous 3 months	The original sample is valid for up to 3 days	
H-BGAS4	A pregnant women who requires blood on standby for obstetric emergencies (e.g. placenta praevia)	A sample may be considered valid for up to 7 days	
H-BGAS5	A chronically transfused patient with no red cell alloantibodies	A sample may be considered valid for up to 7 days after individual risk assessment	
H-BGAS6	A pregnant women over 20 weeks gestation who has anti-D, -C or -K antibodies	Repeat with quantification every 4 weeks until 28 weeks and then every 2 weeks until delivery	Gooch A, Parker J, Wray J, Qureshi H. <i>Guideline for blood grouping and antibody testing in pregnancy</i> . London: British Committee for Standards in Haematology, 2006.
Estimation of fetomaternal haemorrhage (FMH). Refers to the measurement of FMH by Kleihauer and/or flow cytometry			
H-FMH 1	An antenatal sensitising event in an RhD negative women after 20 weeks gestation who is at risk of developing RhD antibodies	Repeat for each new sensitising event unless there is an ongoing sensitising event (e.g. intermittent uterine bleeding) then repeat no more frequently than every 2 weeks	BCSH guideline for the use of anti-D immunoglobulin for the prevention of haemolytic disease of the fetus and newborn. <i>Transfus Med</i> 2014;24:8–20.

REF	Clinical situation	Recommendation	Source
H-FMH2	If FMH >4ml in RhD negative women after 20 weeks gestation who are at risk of developing RhD antibodies (RhD positive baby or fetal RhD status unknown)	Repeat 48 hours after IV anti-D or 72 hours after IM anti-D and repeat process until no detectable fetal cells	BCSH guideline for the use of anti-D immunoglobulin for the prevention of haemolytic disease of the fetus and newborn. <i>Transfus Med</i> 2014;24:8–20.
H-FMH3	After cell salvage in RhD negative women	Check 30–45 minutes after reinfusion of salvaged cells then as per FMH1	

5 Immunology recommendations

If no source is quoted, then the recommendation is based on the response from the RCPATH's SAC for Immunology.

REF	Test	Recommendation	Source
I-1	A3 ganglionic receptor antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-2	Acetyl choline receptor antibody	Frequency determined by clinical context – every 6 months while on treatment	
I-3	Adrenal cortex antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-4	aPL Ab	Annually	
I-5	Alpha-1 antitrypsin genotype	Not routinely required	
I-6	AMPA receptor antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-7	Anti Nuclear antibody (HEP2)	Every 6 months while on treatment	
I-8	Aquaporin 4 antibodies(NMO) CSF	Repeat testing guided by clinical context and only allowed if Oxford clinical questionnaire completed	
I-9	Aquaporin 4 antibodies(NMO) Serum	Repeat testing guided by clinical context and only allowed if Oxford clinical questionnaire completed	
I-10	Basal ganglia antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-11	Beta 2 Microglobulin	Repeat testing of limited value – frequency to be determined by clinical context	
I-12	Beta2-glycoprotein I antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-13	C3/4	90 days	Consensus of surveyed labs
I-14	C3 nephritic factor	Not routinely required if positive Only allowed if C3 below reference range	
I-15	Cardiac muscle antibody	Not routinely required	
I-16	Cardiolipin antibody	Repeat testing of limited value – frequency to be determined by clinical context	

REF	Test	Recommendation	Source
I-17	CCP	Most centres offer only to rheumatologists (NICE CG79).LL	Consensus of surveyed labs
I-18	CD62 ligand shedding	Discuss with lab	
I-19	Complement C1q	Repeat testing of limited value – frequency to be determined by clinical context	Tarzi MD, Hickey A, Förster T, Mohammadi M, Longhurst HJ. An evaluation of tests used for the diagnosis and monitoring of C1 inhibitor deficiency: normal serum C4 does not exclude hereditary angio-oedema. <i>Clin Exp Immunol</i> 2007; 149:513–516.
I-20	Complement 1 inhibitor immunochemical	Only once to confirm Generally only performed if C4 is low or with compatible clinical information.	
I-21	Complement AP100	Only once to confirm Only allowed with compatible clinical information	
I-22	Complement C2	Only once to confirm Only allowed with compatible clinical information	
I-23	Complement CH100	Only once to confirm Only allowed with compatible clinical information	
I-24	Complement Factor B	Only once to confirm Only allowed with compatible clinical information	
I-25	Complement Factor H	Only allowed with compatible clinical information	
I-26	CSF Oligoclonal	Repeat testing of limited value – frequency to be determined by clinical context	
I-27	Cyroglobulin screen	Repeat testing of limited value – frequency to be determined by clinical context	
I-28	Cyroglobulin type	Repeat testing of limited value – frequency to be determined by clinical context	
I-29	DNA(ds)antibody elisa	Every 3–6 months while on treatment	
I-30	Endomysial antibody(IgA)	Not routinely required Only for confirmation of Ttg positives	
I-31	Endomysial antibody(IgG)	Only for patients with complete IgA deficiency	

REF	Test	Recommendation	Source
I-32	Extractable Nuclear Antigens(ENA)RNP Sm Ro La Scl Jo1 & centromere	Repeat testing of limited value – frequency to be determined by clinical context	
I-33	GABA receptor antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-34	GAD 65 antibody	Not routinely required	
I-35	Ganglioside GD1b antibody	Not routinely required	
I-36	Ganglioside GM1 antibody	Not routinely required	
I-37	Ganglioside GQ1b antibody	Not routinely required	
I-38	GBM antibody	Every 3–6 months while on treatment	
I-39	Glycine receptor antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-40	Haemophilus influenza b (Hib) antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-41	Histone antibody	Not routinely required	
I-42	IA2 antibody	Not routinely required	
I-43	IgA low level	Not routinely required	
I-44	IgE	Not routinely required	
I-45	IgG Low Level	Not routinely required	
I-46	IgG subclasses(1,2,3,4)	Not routinely required	
I-47	IgG4	Repeat testing of limited value – frequency to be determined by clinical context	
I-48	Insulin antibody	Not routinely required	
I-49	Intrinsic factor antibody	Not routinely required	Khan S, Del-Duca C, Fenton E, Holding S, Hirst J, Doré PC <i>et al.</i> Limited value of testing for intrinsic factor antibodies with negative gastric parietal cell antibodies in pernicious anaemia. <i>J Clin Path</i> 2009;62:439–441.
I-50	Islet cell antibody	Not routinely required	
I-51	Liver antibody line blot (incl M2(PDH))	Not routinely required	
I-52	Liver autoantibodies	Repeat testing of limited value – frequency to be determined by clinical context	
I-53	Lymphocyte phenotype CD3,4,8,19,56	Discuss with lab	

REF	Test	Recommendation	Source
I-54	Leucocyte adhesion molecules	Discuss with lab	
I-55	Lymphocyte phenotyping extended panel	Discuss with lab	
I-56	Mast cell tryptase	Repeat testing of limited value – frequency to be determined by clinical context	
I-57	MPO ANCA	On treatment: 6 months Off treatment: annually	British Society for Rheumatology Guidelines 2014
I-58	Muscle specific kinase antibody(MUSK)	Repeat testing of limited value – frequency to be determined by clinical context	
I-59	Myelin associated glycoprotein antibody (MAG)	Repeat testing of limited value – frequency to be determined by clinical context	
I-60	Myelin oligodendrocyte (MOG) ab	Not routinely required	
I-61	Myositis antibody profile	Repeat testing of limited value – frequency to be determined by clinical context	
I-62	Neutrophil cytoplasmic antibody(ANCA)	On treatment: 6 months Off treatment: annually	British Society for Rheumatology Guidelines 2014
I-63	Neutrophil oxidative burst	Discuss with lab	
I-64	Nmethyldasparate receptor antibody (NMDA) CSF	Repeat testing of limited value – frequency to be determined by clinical context	
I-65	Nmethyldasparate receptor antibody (NMDA) serum	Repeat testing of limited value – frequency to be determined by clinical context	
I-66	Ovarian antibody	Not routinely required	
I-67	Paraneoplastic antibody profile	Not routinely required	
I-68	Paraprotein (monoclonal band) quantitation	3 months	
I-69	Paraprotein serum gel fix		
I-70	Parathyroid antibody	Not routinely required	
I-71	Parietal cell antibody	Not routinely required	
I-72	Pemphigoid antibody	On treatment: 6 months Off treatment: annually	
I-73	Pemphigus antibody	On treatment: 6 months Off treatment: annually	
I-74	Phospholipase A2 receptor antibody	Repeat testing of limited value – frequency to be determined by clinical context	
I-75	Pituitary antibody	Not routinely required	
I-76	PR3 ANCA	On treatment: 6 months Off treatment: annually	British Society for Rheumatology Guidelines 2014

REF	Test	Recommendation	Source
I-77	Protein(serum) electrophoresis	3 months	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58: 1016–1024
I-78	Protein(serum) electrophoresis	Annually for MGUS	Smellie WSA, Wilson D, McNulty CAM, Galloway MJ, Spickett GA, Finnigan DI <i>et al.</i> Best practice in primary care pathology: review 1. <i>J Clin Pathol</i> 2005;58:1016–1024
I-79	Quantiferon TB IFN gamma	Discuss with lab	
I-80	Rheumatoid factor	Not routinely required	
I-81	Scleroderma antibody profile	Repeat testing of limited value – frequency to be determined by clinical context	
I-82	Serotype Specific APA	Repeat testing of limited value – frequency to be determined by clinical context	
I-83	Serum amyloid A	Repeat testing of limited value – frequency to be determined by clinical context	
I-84	Serum free light chains	3 months – only for diagnosis/monitoring of amyloidosis, non-secretory myeloma and light chain only myeloma	
I-85	Serum immunofixation	Not unless change in serum electrophoresis. Not performed as follow up to electrophoresis unless for remission confirmation	
I-86	Skeletal (striated) muscle antibody	Not routinely required Comment on ordering that imaging is superior for thymoma investigation	
I-87	Specific IgE	Not routinely required	
I-88	Submaxillary gland antibody	Never	
I-89	Tetanus Ab	Repeat testing of limited value – frequency to be determined by clinical context	Consensus of surveyed labs
I-90	tIgE	Repeat testing of limited value – frequency to be determined by clinical context	Consensus of surveyed labs
I-91	Thyroid peroxidase antibody	Not routinely required	

REF	Test	Recommendation	Source
I-92	T Lymphocyte subset CD3,4,8	Discuss with lab	
I-93	TTg IgA antibody	3 months	www.uptodate.com
I-94	TTg IgG antibody	3 months Only on IgA deficient	
I-95	Urine Electrophoresis	Not routinely required	
I-96	Urine Free Light Chain Quant	Repeat testing of limited value – frequency to be determined by clinical context	
I-97	Voltage gated calcium channel antibody (VGCC)	Repeat testing of limited value – frequency to be determined by clinical context	
I-98	Voltage gated potassium channel antibody (VGKC) CSF	Repeat testing of limited value – frequency to be determined by clinical context	
I-99	Voltage gated potassium channel antibody (VGKC) Serum	Repeat testing of limited value – frequency to be determined by clinical context	

6 Microbiology recommendations

6.1 General microbiology

All recommendations in this area of pathology were based on consensus expert peer opinion.

REF	Clinical situation	Recommendation
M-1	AFB microscopy and culture	NA
M-2	Antrum washings	7 days
M-3	ASO titre	14 days
M-4	Aspirates and fluids from sterile sites	NA
M-5	Blood culture	NA
M-6	Blood cultures	NA
M-7	Borrelia burgdorferi (Lyme)	14 days
M-8	Bronchoalveolar lavage	3 days
M-9	Bronchoalveolar lavage	3 days
M-10	Cerebrospinal fluid (CSF)	NA
M-11	Chlamydia/GC NAAT	NA
M-12	Complement Fixation Test (CFT)	14 days
M-13	Cough swab	7 days
M-14	CSF for molecular investigation: e.g. Meningococcus	NA
M-15	CSF microscopy and culture	NA
M-16	Drug Monitoring: Glycopeptides; Vancomycin, Teicoplanin etc	24 hours
M-17	Drug Monitoring: Aminoglycosides; Gentamicin, Amikacin etc	24 hours
M-18	Ear swab	7 days
M-19	Ear/Nose and Throat swab	7 days
M-20	EDTA blood for Meningococcal infection	7 days
M-21	Endocervical swab	NA
M-22	Eye swab	7 days
M-23	Faeces - C.difficile *GDH positive/toxin negative	Dependent on result: Confirmed Positive = 28 days Equivocal* = 24 hours Negative = 24 hours
M-24	Faeces - ova, cysts and parasites	24 hours
M-25	Faeces - routine	7 days
M-26	Genital swab (GC only)	NA
M-27	Genital swab microscopy and culture	NA
M-28	Helicobacter pylori - negative	28 days
M-29	Helicobacter pylori – positive serology	Never
M-29	High vaginal swab (HVS)	NA
M-30	Intrauterine contraceptive device (IUCD)	NA

REF	Clinical situation	Recommendation
M-31	IUCD for Actinomyces	NA
M-32	Joint fluids, microscopy and culture	NA
M-33	Legionella pneumophila Sgp1 antigen	7 days
M-34	Mouth swab	7 days
M-35	MRSA Screen	7 days
M-36	Mycoplasma	14 days
M-37	Nasal swab	7 days
M-38	Nasopharyngeal aspirate	7 days
M-39	Non-directed bronchial lavage	3 days
M-40	PD fluids, microscopy and culture	NA
M-41	Peritoneal fluid	NA
M-42	Pernasal swab (for pertussis)	NA
M-43	Pernasal swabs	7 days
M-44	Pleural effusion/Chest fluids	NA
M-45	Pleural fluid	NA
M-46	Pneumocystis jirovecii (DIF)	NA
M-47	Pus swab	3 days
M-48	Pus/ exudate	NA
M-49	Seminal fluid	28 days
M-50	Skin, nail and hair for mycology	3 months
M-51	Sputum	3 days
M-52	Syphilis	14 days
M-53	Throat swab	Dependent on result: Positive = 7 days Negative = 3 days
M-54	Tissue/bone microscopy and culture	NA
M-55	Tissues and biopsies	NA
M-56	Toxoplasma IgG screen negative	7 days
M-57	Toxoplasma IgG screen positive	Never
M-58	Tuberculosis	NA
M-59	Urethral swab	NA
M-60	Urine for tuberculosis	NA
M-61	Urine, microscopy and culture	3 days
M-62	Wound and ulcer swab	7 days

6.2 Fungal recommendations

Recommendations made based on consensus expert peer opinion with supporting references

REF	Clinical situation	Recommendation	Source
<p><i>Aspergillus</i> galactomannan (GM) (Bio-Rad Platelia <i>Aspergillus</i> ELISA)</p>	<p>Serial screening for blood GM in high risk haematology patients*:</p> <ul style="list-style-type: none"> • Single negative sample can be used to exclude invasive aspergillosis (IA) • Two consecutive positive samples (or same sample retested) provide good positive predictive value • Reduction of the GM index during the first two weeks of antifungal therapy is a reliable predictor of treatment response 	<p>Twice weekly</p>	<p>Maertens J, Verhaegen J, Lagrou K <i>et al.</i> Screening for circulating galactomannan as a noninvasive diagnostic tool for invasive aspergillosis in prolonged neutropenic patients and stem cell transplantation recipients: a prospective validation. <i>Blood</i> 2001;97:1604–1610.</p> <p>Furfaro E, Mikulska M, Miletich F <i>et al.</i> Galactomannan: testing the same sample twice? <i>Transpl Infect Dis</i> 2012;14:E38–E39.</p> <p>Leeflang MM, Debets-Ossenkopp YJ, Vissers CE <i>et al.</i> Galactomannan detection for invasive aspergillosis in immunocompromized patients (Review). <i>The Cochrane Collaboration</i> 2008, issue 4.</p> <p>Chai LYA, Kullberg BJ, Johnson EM <i>et al.</i> Early serum galactomannan trend as a predictor of outcome of invasive aspergillosis. <i>J Clin Microbiol</i> 2012;50(7):2330.</p> <p>Nouer SA, Nucci M, Kumar NS <i>et al.</i> Earlier response assessment in invasive aspergillosis based on the kinetics of serum aspergillus galactomannan : proposal for a new definition. <i>Clin Infect Dis</i> 2011;53:671–676.</p> <p>Bergeron A, Porcher R, Menotti J <i>et al.</i> Prospective evaluation of clinical and biological markers to predict</p>

			<p>the outcome of invasive pulmonary aspergillosis in hematological patients. <i>J Clin Microbiol</i> 2012;50 (3):823.</p> <p>Schelenz S, Barnes RA, Barton RC <i>et al.</i> British Society for Medical Mycology best practice recommendations for the diagnosis of serious fungal diseases. <i>Lancet Infect Dis</i> 2015;15(4):461–74. doi: 10.1016/S1473–3099(15)70006-X. Epub 2015 Mar 12. Review.</p>
Combination of blood GM and <i>Aspergillus</i> PCR	<p>Screening of high risk haematology patients*:</p> <ul style="list-style-type: none"> • Single sample with both GM and PCR positive has good positive predictive value for IA 	Twice weekly	<p>Morrissey CO, Chen SCA, Sorrell TC <i>et al.</i> Galactomannan and PCR versus culture and histology for directing use of antifungal treatment for invasive aspergillosis in high-risk haematology patients: a randomized controlled trial. <i>The Lancet</i> 2013;13:519–528.</p> <p>Springer J, Morton CO, Perry M <i>et al.</i> Multicenter comparison of serum and whole-blood specimens for detection of aspergillus DNA in high-risk hematological patients. <i>J Clin Microbiol</i> 2013;51(5):1445.</p>
β -1-3- <i>D</i> -glucan (BDG) (Fungitell, Associates of Cape Cod Inc.)	<p>Screening for severely ill ICU patients and patients with haematological malignancies and post allogeneic hematopoietic stem cell transplants:</p> <ul style="list-style-type: none"> • Single negative sample can be 	Twice weekly	<p>Eggimann P, Marchetti O. Is (1→3)-β-D-glucan the missing link from bedside assessment to pre-emptive therapy of invasive candidiasis? <i>Crit Care</i> 2011;15(6):1017. doi: 10.1186/cc10544.</p> <p>Cuenca-Estrella M, Verweij PE, Arendrup MC <i>et al.</i> ESCMID* guideline for the diagnosis and management of <i>Candida</i> diseases 2012:</p>

	<p>used to exclude invasive fungal infection (IFI)</p> <ul style="list-style-type: none"> • Repeatedly positive BDG results may be used as supportive evidence for the presence of an IFI 		<p>diagnostic procedures. <i>Clin Microbiol Infect</i> 2012 Dec;18 Suppl 7:9–18. doi: 10.1111/1469–0691.12038.</p> <p>Hammarström H, Kondori N, Friman V, Wennerås C. How to interpret serum levels of beta-glucan for the diagnosis of invasive fungal infections in adult high-risk hematology patients: optimal cut-off levels and confounding factors. <i>Eur J Clin Microbiol Infect Dis</i> 2015;34(5):917–925.</p> <p>Schelenz S, Barnes RA, Barton RC, Cleverley JR, Lucas SB, Kibbler CC, Denning DW; British Society for Medical Mycology. British Society for Medical Mycology best practice recommendations for the diagnosis of serious fungal diseases. <i>Lancet Infect Dis</i> 2015;15(4):461–74. doi: 10.1016/S1473–3099(15)70006-X. Epub 2015 Mar 12. Review.</p>
<p><i>Aspergillus</i> galactomannan (GM) (Bio-Rad Platelia <i>Aspergillus</i> ELISA)</p>	<p>Serial screening for blood GM in high risk haematology patients*:</p> <ul style="list-style-type: none"> • Single negative sample can be used to exclude invasive aspergillosis (IA) • Two consecutive positive samples (or same sample retested) provide good positive predictive value. 	<p>Twice weekly</p>	<p>Maertens J, Verhaegen J, Lagrou K <i>et al.</i> Screening for circulating galactomannan as a noninvasive diagnostic tool for invasive aspergillosis in prolonged neutropenic patients and stem cell transplantation recipients: a prospective validation. <i>Blood</i> 2001;97:1604–1610.</p> <p>Furfaro E, Mikulska M, Miletich F <i>et al.</i> Galactomannan: testing the same sample twice? <i>Transpl Infect Dis</i> 2012;14:E38–E39.</p> <p>Leeflang MM, Debets-Ossenkopp YJ, Vissers CE <i>et al.</i> Galactomannan detection</p>

	<ul style="list-style-type: none"> • Reduction of the GM index during the first two weeks of antifungal therapy is a reliable predictor of treatment response 		<p>for invasive aspergillosis in immunocompromized patients (Review). <i>The Cochrane Collaboration</i> 2008, issue 4.</p> <p>Chai LYA, Kullberg BJ, Johnson EM <i>et al.</i> Early serum galactomannan trend as a predictor of outcome of invasive aspergillosis. <i>J Clin Microbiol</i> 2012;50(7):2330.</p> <p>Nouer SA, Nucci M, Kumar NS <i>et al.</i> Earlier response assessment in invasive aspergillosis based on the kinetics of serum aspergillus galactomannan : proposal for a new definition. <i>Clin Infect Dis</i> 2011;53:671–676.</p> <p>Bergeron A, Porcher R, Menotti J <i>et al.</i> Prospective evaluation of clinical and biological markers to predict the outcome of invasive pulmonary aspergillosis in hematological patients. <i>J Clin Microbiol</i> 2012;50(3):823.</p> <p>Schelenz S, Barnes RA, Barton RC <i>et al.</i> British Society for Medical Mycology best practice recommendations for the diagnosis of serious fungal diseases. <i>Lancet Infect Dis</i> 2015;15(4):461–474. doi: 10.1016/S1473–3099(15)70006-X. Epub 2015 Mar 12. Review.</p>
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*Neutropaenic patients and allogeneic stem cell transplantation recipients during the early engraftment phase, who are not on mould-active antifungal prophylaxis or treatment.

7 Virology recommendations

If no source is quoted, then the recommendation is based on the response from the RCPATH's SAC for Virology

7.1 Congenital/perinatal bloodborne viral infection – testing in asymptomatic infants

REF	Clinical situation	Recommendation	Source
V-1	Maternal infection with HIV	<p>Test infant blood (EDTA): HIV DNA (proviral DNA) PCR within 48 hours of birth and/or HIV RNA PCR within 48 hours of birth, repeat HIV RNA PCR at 6 weeks (ie 2 weeks after cessation of prophylaxis), repeat HIV RNA PCR at 12 weeks (ie 2 months after cessation of prophylaxis)</p> <p>Test infant blood (clotted): anti-HIV antigen/antibody – at 18 months</p>	<p>Taylor GP1, Clayden P, Dhar J, Gandhi K, Gilleece Y, Harding K <i>et al.</i> British HIV Association guidelines for the management of HIV infection in pregnant women 2012 <i>HIV Medicine</i> 2012;13 (Suppl. 2):87–157.</p>
V-2	Maternal infection with hepatitis B	<p>Test infant blood (clotted) or infant blood (dried blood spot): Hepatitis B surface antigen at 12 months (or later at conclusion of prophylaxis if vaccine course delayed beyond 12 months)</p>	<p>Hepatitis B: chapter 18. Immunisation against Infectious Diseases 'The Green Book'. Public Health England, 2013.</p>
V-3	Maternal infection with hepatitis C	<p>Test infant blood (EDTA), blood (clotted), blood (dried blood spot): Hepatitis C RNA PCR at 2–3 months, repeat HCV RNA PCR at 6 months (no further PCR follow up if negative)</p> <p>Test infant blood (clotted or dried blood spot): Anti-HCV antibody at 12–18 months (no further follow up if negative)</p>	<p>Public Health England. <i>UK Standards for Microbiological Investigations V8: Vertical and Perinatal Transmission of Hepatitis C</i>. PHE, 2014. https://www.gov.uk/government/publications/smi-v-8-vertical-hcv-transmission</p>

7.2 Congenital viral infection

REF	Clinical situation	Recommendation	Source
V-4	Suspected congenital infection	PCR – for CMV (urine, saliva) within three weeks of birth; blood (less sensitive) within 3 weeks of birth. No need to repeat PCR – toxoplasma, HSV, rubella, syphilis – blood, throat swab, nose swab, lesions	Kadambari S, Williams EJ, Luck S, Griffiths PD, Sharland M. Evidence based management guidelines for the detection and treatment of congenital CMV. <i>Early Hum Dev.</i> 2011;87:723–728.
V-5	Suspected congenital infection	IgM antibody (within 3 weeks of birth). No need to repeat except syphilis repeat at 6–8 weeks	
V-6	Suspected congenital infection	IgG antibody – if negative no need to repeat	

7.3 Viral encephalitis investigation

REF	Clinical situation	Recommendation	Source
V-7	Encephalitis	Test CSF for HSV, VZV, enterovirus nucleic acid by PCR as soon as possible Negative CSF PCRs - repeat HSV, VZV, enterovirus PCRs in 48 hours, consider additional PCRs	Solomon T, Michael BD, Smith PE, Sanderson F, Davies NW, Hart IJ <i>et al.</i> Management of suspected viral encephalitis in adults –Association of British Neurologists and British Infection Association National Guidelines. <i>J Infect</i> 2012;64:347–373.
V-8	Herpes simplex encephalitis management	Test CSF for HSV DNA by PCR after 14 days treatment (immunocompetent) Consider repeat test 7–10 days later	Solomon T, Michael BD, Smith PE, Sanderson F, Davies NW, Hart IJ <i>et al.</i> Management of suspected viral encephalitis in adults--Association of British Neurologists and British Infection Association National Guidelines. <i>J Infect</i> 2012;64:347–373.

7.4 Bloodborne viruses – respiratory tract infection

REF	Clinical situation	Recommendation	Source
V-9	Respiratory virus infection or respiratory bacterial infection with mycoplasma, chlamydia/chlamydo phila, Q fever	<p>Samples investigated for respiratory virus infections must be tested by PCR testing where possible.</p> <p>Serological testing for atypical pneumonia is generally carried out by complement fixation test.</p> <p>Test blood (clotted) collected >10 days after first blood in parallel with previous sample to available range of antigens for mycoplasma, chlamydia/chlamydo phila, Q fever</p>	
V-11	Q fever	<p>Test clotted blood for IgG phase 2 and IgM soon after onset</p> <p>Test clotted blood in parallel with blood 7–14 days later</p> <p>Test clotted blood at 6 months for <i>C.burnetii</i> IgA and phase 1 IgG to exclude chronic infection</p>	<p>Anderson A, Bijlmer H, Fournier PE, Graves S, Hartzell J, Kersh GJ <i>et al.</i> Diagnosis and management of Q fever – United States 2013: Recommendations from CDC and the Q Fever Working Group. <i>MMWR Recomm Rep</i> 2013;29:1–30.</p>

7.5 Renal testing

REF	Clinical situation	Recommendation	Source
V-12	Renal failure – dialysis screen, UK dialysis only	Test HIV antigen/antibody, HCV antibody, antigen/antibody or antigen, HBsAg pre-dialysis	Public Health England. <i>UK Standards for Microbiology Investigations V 10: Bloodborne virus testing in dialysis patients</i> . PHE, 2014. www.gov.uk/government/publications/smi-v-10-bloodborne-virus-testing-in-dialysis-patients
V-13		Test HIV 3 monthly (if risk factors)	Public Health England. <i>UK Standards for Microbiology Investigations V 10: Bloodborne virus testing in dialysis patients</i> . PHE, 2014. www.gov.uk/government/publications/smi-v-10-bloodborne-virus-testing-in-dialysis-patients
V-14		Test HCV 3 monthly	Public Health England. <i>UK Standards for Microbiology Investigations V 10: Bloodborne virus testing in dialysis patients</i> . PHE, 2014. www.gov.uk/government/publications/smi-v-10-bloodborne-virus-testing-in-dialysis-patients
V-15		Test HBsAg 1-3 monthly	Public Health England. <i>UK Standards for Microbiology Investigations V 10: Bloodborne virus testing in dialysis patients</i> . PHE, 2014. www.gov.uk/government/publications/smi-v-10-bloodborne-virus-testing-in-dialysis-patients
V-16	Renal failure – dialysis abroad (Also refer to DoH guidance on BBV testing following dialysis abroad)	Test HCV NAAT or HCV antigen or HCV antigen/antibody every 2 weeks for 3 months	Renal Association; expert opinion
V-17		Test HBsAg or HBV NAAT every 2 weeks for 3 months	Renal Association. <i>Blood Borne Virus Infection</i> . Hampshire: Renal Association, 2009.

REF	Clinical situation	Recommendation	Source
V-18		Test HIV antigen/antibody every 2 weeks for 3 months	Renal Association. <i>Blood Borne Virus Infection</i> . Hampshire: Renal Association, 2009.
V-19	Renal failure – dialysis but HBsAg negative and known anti-HBs response to vaccine >100 mIU/mL	Test HBsAg yearly	Renal Association. <i>Blood Borne Virus Infection</i> . Hampshire: Renal Association, 2009.

7.6 Post-exposure to bloodborne viruses

REF	Clinical situation	Recommendation	Source
V-20	Potential significant exposure to HBsAg positive material, hepatitis B susceptible	Collect baseline blood for storage. Test HBsAg at 3 months Test HBsAg, anti-HBc at 6 months Test anti-HBs 1–2 months after vaccine course	
V-21	Potential significant exposure to HIV positive material but no postexposure prophylaxis given	Test for HIV antigen/antibody at 12 weeks, no further test required	DoH. HIV post-exposure prophylaxis Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS. Department of Health, 2008. www.gov.uk/government/news/hiv-post-exposure-prophylaxis-guidance-from-the-uk-chief-medical-officers-expert-advisory-group-on-aids
V-22	Potential significant exposure to HIV positive material and postexposure prophylaxis given	Test for HIV antigen/antibody at 12 weeks after cessation of postexposure prophylaxis, no further test required	DoH. HIV post-exposure prophylaxis Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS. Department of Health, 2008. www.gov.uk/government/news/hiv-post-exposure-prophylaxis-guidance-from-the-uk-chief-medical-officers-expert-advisory-group-on-aids
V-23	Potential significant exposure to HCV positive material	Test at 6 weeks and 12 weeks by HCV NAAT If negative test at 12 and 24 weeks with HCV antibody	Ramsay ME. Guidance on the investigation and management of occupational exposure to hepatitis C. <i>Commun Dis Public Health</i> 1999;2:258–262.

8 Cellular pathology recommendations

All recommendations in this area of pathology were based on consensus expert peer opinion.

Letters in parenthesis refer to recommendation number.

8.1 General aspects of laboratory practice

- a) It is not helpful to specify minimum retesting intervals for the majority of cellular pathology specimens which tend to be unique to a particular clinical episode. The areas where repeat sampling/re-biopsy or laboratory testing may be considered are detailed in sections (2) and (3). (CP-1)
- b) Where a diagnosis has been confidently established on pre-operative biopsies, is it usually not necessary to confirm the immunohistochemical phenotype or molecular genetic changes on resection specimens. More specific guidance on retesting may be found in the RCPATH's datasets for cancer histopathology reports and tissue pathways (www.rcpath.org/publications). (CP-2)
- c) No specific implications or roles have been identified for minimum resting intervals in neuropathology or the non forensic autopsy. (CP-3)

8.2 Exfoliative and fine needle aspiration cytology

- a) For patients whose tissues are sampled as part of national screening programmes, the sampling interval for asymptomatic patients will be determined by the programme. The investigation of symptoms or clinical abnormalities should be investigated as appropriate and is out with the screening service. (CP-4)
- b) When considering the appropriate tests to request, the negative predictive value should be considered. Some tests, such as urine or nipple discharge cytology, are recognised as having a low negative predictive value and thus cannot be used to exclude significant disease. Repeating such tests does not provide further reassurance or negate previous equivocal results. (CP-5)
- c) Repeatedly sending samples when a definitive diagnosis (e.g. positive for specific tumour type) has been established is a waste of resources. A repeat sample may be necessary if an initial specimen does not provide sufficient information for clinical management. (CP-6)
- d) Cytological surveillance of asymptomatic patients following malignant disease (e.g. urine specimens as follow up for urothelial carcinoma) should not be performed more frequently than annually. The development of symptoms should be investigated as appropriate. (CP-7)

8.3 Histopathology

- a) In general, biopsies are taken for specific clinical indications. A repeat biopsy may be necessary if an initial biopsy does not provide sufficient information for clinical management. (CP-8)
- b) When clinical features or disease progression do not fit with a previously established diagnosis then review of previous biopsy material should be undertaken before considering a repeat biopsy. (CP-9)
- c) Where patients are undergoing regular clinical review, e.g. endoscopies for Barrett's, inflammatory bowel disease, repeated biopsies may be required to monitor response to treatment or to detect progressive disease at an early stage. (CP-10)
- d) Rebiopsy in chronic renal disease – an annual (for example) biopsy is recommended for monitoring and should not be repeated more frequently unless clinically indicated. (CP-11)
- e) Repeat liver biopsies are only done by protocol for disease progression monitoring e.g. post-transplant hep C, or if the initial sample is insufficient for diagnosis. (CP-12)

9 Contributors

Many people were involved in the preparation and/or the review of recommendations for minimal retesting intervals in pathology. The leads of the project would like to acknowledge all the work of the panel members in particular in contributing to the preparation of this document.

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