National minimum retesting intervals in pathology

March 2021

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<td>Document name</td>
<td>National minimum retesting intervals in pathology</td>
</tr>
<tr>
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<td>2</td>
</tr>
<tr>
<td>Produced by</td>
<td>Dr Tim Lang is the main project lead and author of the previous minimum retesting intervals for clinical biochemistry. Dr Bernie Croal is the demand optimisation lead and coordinator of this wider pathology version.</td>
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<tr>
<td>Comments</td>
<td>This document will replace the 1st edition of National minimum retesting intervals in pathology published in December 2015. This version, incorporating other pathology disciplines, was coordinated by the Royal College of Pathologists (RCPath). While it is published in accordance with the RCPath’s publication policy, it should be regarded as a joint document between the RCPath and Association for Clinical Biochemistry and Laboratory Medicine and therefore the intellectual property of both. Both organisations, along with the Institute of Biomedical Science, have formally endorsed its contents and hence their logos appear above. In accordance with the College’s pre-publications policy, this document was on the Royal College of Pathologists’ website for consultation from 15 December 2020 to 12 January 2021. Responses and authors’ comments are available to view, following final publication of this document.</td>
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For full details on our accreditation visit: www.nice.org.uk/accreditation.
Foreword

The National minimum retesting interval in pathology guidelines published by the Royal College of Pathologists (RCPath) are guidelines which enable pathologists, clinical scientists and biomedical scientists to identify and deal with inappropriate requesting of samples performed in the management of patients in a consistent manner and to a high standard. Guidelines are systematically developed statements to assist the decisions of practitioners and patients about appropriate healthcare for specific clinical circumstances and are based on the best available evidence at the time the document was prepared. This guideline has been developed to cover most common circumstances. However, we recognise that guidelines cannot anticipate every pathological specimen type and clinical scenario. Occasional variation from the practice recommended in this guideline may therefore be required to report a result on a specimen in a way that maximises benefit to the patient.

The guidelines themselves constitute the tools for implementation and dissemination of good practice.

The following stakeholders were contacted to consult on this document:

- National Demand Optimisation Group Scotland
- GIRFT team for NHS England
- Association for Clinical Biochemistry and Laboratory Medicine
- Institute of Biomedical Scientists.

The information used to develop this guideline was collected from the current medical literature and a previous version of this guideline. Published evidence was evaluated using modified SIGN guidance (see Appendix A). Consensus of evidence in the guideline was achieved by expert review. Gaps in the evidence were identified by College Fellows via feedback received from consultation. The sections of this guideline that indicate compliance with each of the AGREE II standards are indicated in Appendix B.

No major organisational changes or cost implications have been identified that would hinder the implementation of the guideline. The remit of our guidelines (and the College) is to provide guidance on the quality of a diagnostic service and detailed consideration of costs is outside the College’s remit.

A formal revision cycle for all guidelines takes place on a five-yearly basis. However, each year, the College will ask the author(s) of the guidelines, in conjunction with the relevant specialty advisers to the College, to consider whether or not the document needs to be updated or revised. A full consultation process will be undertaken if major revisions are required. If minor revisions are required, an abridged consultation process will be undertaken whereby a short note of the proposed changes will be placed on the College website for two weeks for members’ attention. If members do not object to the changes, the changes will be incorporated into the guideline and the full revised version (incorporating the changes) will replace the existing version on the publications page of the College.

The pathway has been reviewed by the Clinical Effectiveness team, Lay Governance Group and the RCPPath Specialty Advisory Committees and was placed on the College website for consultation with the membership from 15 December 2020 to 12 January 2021. All comments received from the membership were addressed by the authors to the satisfaction of the Clinical Lead for Guideline Review.

This guideline was developed without external funding to the writing group. The College requires the authors of guidelines to provide a list of potential conflicts of interest; these are monitored by the Clinical Effectiveness team and are available on request. The authors of this document have declared that there are no conflicts of interest.
**Abbreviations and acronyms**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS</td>
<td>Acute coronary syndrome</td>
</tr>
<tr>
<td>AFB</td>
<td>Acid-fast bacilli</td>
</tr>
<tr>
<td>AKI</td>
<td>Acute kidney injury</td>
</tr>
<tr>
<td>ALP</td>
<td>Alkaline phosphatase</td>
</tr>
<tr>
<td>AMPA</td>
<td>2-amino-3-(5-methyl-3-oxo-1,2-oxazol-4-yl) propanoic acid</td>
</tr>
<tr>
<td>ANCA</td>
<td>Anti-neutrophil cytoplasmic antibody</td>
</tr>
<tr>
<td>Anti-HBc</td>
<td>Hepatitis B total core antibody</td>
</tr>
<tr>
<td>Anti-HBs</td>
<td>Hepatitis B surface antibody</td>
</tr>
<tr>
<td>Anti-HCV</td>
<td>Hepatitis C antibody</td>
</tr>
<tr>
<td>APA</td>
<td>Anti-pneumococcal antibody</td>
</tr>
<tr>
<td>aPL</td>
<td>Antiphospholipid</td>
</tr>
<tr>
<td>APTT</td>
<td>Activated partial thromboplastin time</td>
</tr>
<tr>
<td>ASO</td>
<td>Antistreptolysin O</td>
</tr>
<tr>
<td>ATPoab</td>
<td>Anti-thyroid peroxidase antibodies</td>
</tr>
<tr>
<td>BBV</td>
<td>Blood-borne virus</td>
</tr>
<tr>
<td>BCSH</td>
<td>British Committee for Standards in Haematology</td>
</tr>
<tr>
<td>BDG</td>
<td>β-1-3-D-glucan</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index</td>
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<tr>
<td>BNP</td>
<td>B-type natriuretic peptide</td>
</tr>
<tr>
<td>C3</td>
<td>Complement component C3</td>
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<td>C4</td>
<td>Complement component C4</td>
</tr>
<tr>
<td>CA15.3</td>
<td>Carbohydrate antigen 15.3</td>
</tr>
<tr>
<td>CA19.9</td>
<td>Carbohydrate antigen 19.9</td>
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<tr>
<td>CCP</td>
<td>Cyclic citrullinated peptide antibody</td>
</tr>
<tr>
<td>CEA</td>
<td>Carcinoembryonic antigen</td>
</tr>
<tr>
<td>CFA</td>
<td>Coagulation factor assay</td>
</tr>
<tr>
<td>CFT</td>
<td>Complement fixation test</td>
</tr>
<tr>
<td>CG</td>
<td>Clinical Guideline</td>
</tr>
<tr>
<td>CKD</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>CRP</td>
<td>C-reactive protein</td>
</tr>
<tr>
<td>CS</td>
<td>Clotting screen</td>
</tr>
<tr>
<td>CSF</td>
<td>Cerebrospinal fluid</td>
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<tr>
<td>DIF</td>
<td>Direct immunofluorescence</td>
</tr>
<tr>
<td>EASL</td>
<td>European Association of the Study of the Liver</td>
</tr>
<tr>
<td>ED</td>
<td>Exposure day</td>
</tr>
<tr>
<td>eGFR</td>
<td>Estimated glomerular filtration rate</td>
</tr>
<tr>
<td>eGFR-EPI</td>
<td>eGFR according to CKD Epidemiology Collaboration equation</td>
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<tr>
<td>ENA</td>
<td>Extractable nuclear antigen</td>
</tr>
<tr>
<td>ESR</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>FSH</td>
<td>Follicle stimulating hormone</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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</tr>
<tr>
<td>FBC</td>
<td>Full blood count</td>
</tr>
<tr>
<td>FMH</td>
<td>Fetomaternal haemorrhage</td>
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<tr>
<td>fT3</td>
<td>Free triiodothyronine</td>
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<tr>
<td>fT4</td>
<td>Free thyroxine</td>
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<tr>
<td>GAD65</td>
<td>Glutamic acid decarboxylase antibody</td>
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<td>GAIN</td>
<td>Guidelines and Audit Implementation Network</td>
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<td>GC</td>
<td>Neisseria gonorrhoeae</td>
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<td>GDH</td>
<td>Glutamate dehydrogenase</td>
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<tr>
<td>GGT</td>
<td>Gamma-glutamyltransferase</td>
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<tr>
<td>GM</td>
<td>Galactomannan</td>
</tr>
<tr>
<td>GPC</td>
<td>Gastric parietal cell antibody</td>
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<td>Hb</td>
<td>Haemoglobin</td>
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<td>Haemoglobin A1c</td>
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<td>Hepatitis B surface antigen</td>
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<td>Hepatitis B virus</td>
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<tr>
<td>HCC</td>
<td>Hepatocellular carcinoma</td>
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<td>hCG</td>
<td>Human chorionic gonadotropin</td>
</tr>
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<td>Hepatitis C virus</td>
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<td>Hepatitis C RNA PCR</td>
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<td>HD</td>
<td>Haemodialysis</td>
</tr>
<tr>
<td>HDL</td>
<td>High-density lipoprotein</td>
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<tr>
<td>Hib</td>
<td>Haemophilus influenza type b</td>
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<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>HIV Ag/Ab</td>
<td>Human immunodeficiency virus antigen/antibody</td>
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<td>HRT</td>
<td>Hormone replacement therapy</td>
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<td>IA</td>
<td>Invasive aspergillosis</td>
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<tr>
<td>Ig</td>
<td>Immunoglobulin</td>
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<tr>
<td>IGF-1</td>
<td>Insulin-like growth factor 1</td>
</tr>
<tr>
<td>IHD</td>
<td>Ischaemic heart disease</td>
</tr>
<tr>
<td>INR</td>
<td>International normalised ratio</td>
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<tr>
<td>ITT</td>
<td>Immune tolerance therapy</td>
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<td>ITU</td>
<td>Intensive treatment unit</td>
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<td>IUCD</td>
<td>Intrauterine contraceptive device</td>
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<td>IV</td>
<td>Intravenous</td>
</tr>
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<td>IVF</td>
<td>In vitro fertilisation</td>
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<td>LA</td>
<td>Lupus anticoagulant</td>
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<tr>
<td>LCMS</td>
<td>Liquid chromatography mass spectrometry</td>
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<tr>
<td>LFT</td>
<td>Liver function test</td>
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<tr>
<td>LMWH</td>
<td>Low-molecular-weight heparin</td>
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<tr>
<td>MAG</td>
<td>Myelin-associated glycoprotein</td>
</tr>
<tr>
<td>MBD</td>
<td>Mineral bone disease</td>
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<tr>
<td>MDRD</td>
<td>Modification of diet in renal disease</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>MGUS</td>
<td>Monoclonal gammopathy of undetermined significance</td>
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<tr>
<td>MOG</td>
<td>Myelin oligodendrocyte</td>
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<td>MPO</td>
<td>Myeloperoxidase antibodies</td>
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<tr>
<td>MRI</td>
<td>Minimum retesting interval</td>
</tr>
<tr>
<td>MRSA</td>
<td>Methicillin-resistant <em>Staphylococcus aureus</em></td>
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<tr>
<td>MTC</td>
<td>Medullary thyroid carcinoma</td>
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<tr>
<td>NAAT</td>
<td>Nucleic acid amplification test</td>
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<tr>
<td>NICE</td>
<td>National Institute for Health and Care Excellence</td>
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<td>NMDA</td>
<td>N-methyl-D-aspartate</td>
</tr>
<tr>
<td>NMO</td>
<td>Neuromyelitis optica</td>
</tr>
<tr>
<td>NT-ProBNP</td>
<td>N-terminal pro-B-type natriuretic peptide</td>
</tr>
<tr>
<td>OGTT</td>
<td>Oral glucose tolerance test</td>
</tr>
<tr>
<td>OH</td>
<td>Occupational Health</td>
</tr>
<tr>
<td>PBLC</td>
<td>Peripheral blood lymphocyte cells</td>
</tr>
<tr>
<td>PCC</td>
<td>Prothrombin complex concentrate</td>
</tr>
<tr>
<td>PD</td>
<td>Peritoneal dialysis</td>
</tr>
<tr>
<td>Plt</td>
<td>Platelets</td>
</tr>
<tr>
<td>PEP</td>
<td>Post-exposure prophylaxis</td>
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<tr>
<td>PR3</td>
<td>Proteinase 3 antibodies</td>
</tr>
<tr>
<td>PSA</td>
<td>Prostate-specific antigen</td>
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<tr>
<td>PT</td>
<td>Prothrombin time</td>
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<td>PTH</td>
<td>Parathyroid hormone</td>
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<td>RCPath</td>
<td>The Royal College of Pathologists</td>
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<td>RPR</td>
<td>Rapid plasma regain</td>
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<td>SAC</td>
<td>Specialty Advisory Committee of the RCPath</td>
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<td>SIGN</td>
<td>Scottish Intercollegiate Guidelines Network</td>
</tr>
<tr>
<td>TB IFN</td>
<td>Tuberculosis interferon</td>
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<tr>
<td>TFT</td>
<td>Thyroid function tests</td>
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<tr>
<td>Tg</td>
<td>Thyroglobulin</td>
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<tr>
<td>TgAb</td>
<td>Tg autoantibodies</td>
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<tr>
<td>tIgE</td>
<td>Total IgE</td>
</tr>
<tr>
<td>TPN</td>
<td>Total parenteral nutrition</td>
</tr>
<tr>
<td>TSH</td>
<td>Thyroid stimulating hormone</td>
</tr>
<tr>
<td>tTG</td>
<td>Tissue transglutaminase</td>
</tr>
<tr>
<td>U&amp;E</td>
<td>Urea and electrolytes</td>
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<td>VGCC</td>
<td>Voltage-gated calcium channel</td>
</tr>
<tr>
<td>VGKC</td>
<td>Voltage-gated potassium channel</td>
</tr>
<tr>
<td>VKA</td>
<td>Vitamin K antagonist</td>
</tr>
<tr>
<td>WCC</td>
<td>White cell count</td>
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</table>
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 appointments 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.\textsuperscript{1,2} The frequency with which 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
- 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.

Each MRI is proposed for a specific clinical scenario and therefore the population to which the guideline refers to is specific to that population described. This may be all patients being investigated, those in the general practice population, those in hospital population or a combination. If not stated specifically in the guideline, then it applies to all patients being managed.

1.2 Establishing MRI

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.\textsuperscript{3} It was 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 were performed using a strategy previously used in this area.\textsuperscript{4} However, little published evidence was identified on the use or production of MRI in clinical practice.

The next phase of the project was the convening of small groups, made up of invited members of the CPS 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 \textit{et al} termed ‘the state of the art’.\textsuperscript{5}

The evidence or source for these recommendations has been taken from a number of authorities such as the National Institute for Health and Care Excellence (NICE), NHS Clinical Knowledge Summaries (formerly PRODIGY) and the SIGN. The Clinical Knowledge Summaries 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 CPS 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 Target users and health benefits of these guidelines

The primary users of these guidelines are trainee and consultant pathologists, biomedical and clinical scientists, and laboratory managers.

1.4 Using MRI in practice

Information regarding College guidelines is via bulk email and the President’s e-newsletter. Published guidelines can be downloaded free of charge from the College website (https://www.rcpath.org/profession/guidelines/cancer-datasets-and-tissue-pathways.html).

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

- education of requesters so that appropriate tests are requested at the right time and for the right patient using different sources of evidence such as case studies, published studies showing the clinical and financial benefits, benchmarking and clinical audit
- information on request cards or in pathology handbooks regarding when to repeat a test
- delivery of prompts to remind the 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.
- 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. The way in which 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 an 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 MRI 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 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. Therefore, 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.

Each recommendation specifies a time interval that may be used to audit the implementation and adherence to the recommendation in clinical practice by measuring the percentage of requests that reflect the specific MRI.

1.5 **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.
## Biochemistry recommendations

### 2.1 Renal (refers to the measurement of U&E, unless otherwise stated)

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-R1</td>
<td>Normal follow up</td>
<td>A repeat would be indicated on clinical grounds if there was a significant change in the patient’s condition that indicated that an acute renal (or other electrolyte-related problem) was developing</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-R2</td>
<td>Inpatient monitoring of a stable patient not on IV fluids</td>
<td>An inpatient with an admission sodium within the reference range should not have a repeat sodium within the average length of stay of four days</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-R3</td>
<td>Inpatient monitoring of a stable patient on IV fluids (adults as well as children)</td>
<td>Daily monitoring of U&amp;E and glucose</td>
<td>GAIN, 2010.6 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-R4</td>
<td>In symptomatic patients or following administering of hypertonic saline</td>
<td>Monitoring should be more frequent, i.e. every two to four hours</td>
<td>GAIN, 2010.6 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-R5</td>
<td>Patient diagnosed with AKI</td>
<td>U&amp;E checked on admission and within 24 hours</td>
<td>The Renal Association, 2011.7 [Level of evidence – A.]</td>
</tr>
<tr>
<td>B-R6</td>
<td>Monitoring of ACE inhibitors</td>
<td>Within one week of starting and one week after each dose titration, then annually (unless required more frequently because of impaired renal function) Drugs containing trimethoprim can also result in a marked increase in serum creatinine without directly affecting kidney function. The serum creatinine should be repeated to obtain a more accurate serum creatinine (and eGFR) 48 hours after trimethoprim containing medications are stopped</td>
<td>NICE Clinical Knowledge Summary, 2019.8 GAIN, 2015.5 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-R7</td>
<td>Diuretic therapy</td>
<td>Before the initiation of therapy and after four weeks, and then six monthly/yearly or more frequently in the elderly or in patients with renal disease, disorders affecting electrolyte status or patients taking other drugs (e.g. corticosteroids, digoxin)</td>
<td>NICE Clinical Knowledge Summary, 2019.8 [Level of evidence – D.]</td>
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<td>Ref</td>
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| 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                                                                                  | NICE Clinical Knowledge Summary, 2019.10  
NICE Clinical Knowledge Summary, 2019.11  
[Level of evidence – D.]                                                                                                          |
| B-R9 | Monitoring of potassium concentrations in patients receiving digoxin and diuretics| Regular monitoring                                                                                                                                                                                                 | National Public Health Service for Wales, 2008.12  
[Level of evidence – D.]                                                                                                               |
| B-R10| Aminosalicylates                                                                  | In the elderly, every three months in first year, then every six months for the next four years, then annually after that based on personal risk factors                                                                                                                                 | NICE Clinical Knowledge Summary, 2019.13  
[Level of evidence – D.]                                                                                                               |
| B-R11| Carbamazepine                                                                     | Six months                                                                                                                                                                                                      | NICE Clinical Knowledge Summary, 2019.13  
[Level of evidence – D.]                                                                                                               |
| B-R12| Antipsychotics                                                                    | 12 months                                                                                                                                                                                                      | NICE Clinical Knowledge Summary, 2019.14  
[Level of evidence – D.]                                                                                                               |
| B-R13a| eGFR-EPI: CKD                                                                      | Repeat in 14 days if new finding of reduced GFR and/or confirmation of eGFR <60 mL/min/1.73 m² *eGFR by MDRD not valid in AKI                                                                              | NICE. CG182, 2014.15  
[Level of evidence – D.]                                                                                                               |
| B-R13b| eGFR-EPI: Radiological procedures/contrast administration                          | eGFR or creatinine within previous seven days in patients with acute illness or renal disease  
eGFR for angiography: <60 mL/min/1.73 m² should trigger local guidelines for contrast dosage  
eGFR for gadolinium: <30 mL/min/1.73 m² high-risk agents contraindicated  
eGFR: 30–59 mL/min/1.73 m² lowest dose possible can be used and not repeated within seven days | Royal College of Radiologists, 2015.16  
[Level of evidence – GPP.]                                                                                                             |
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<tbody>
<tr>
<td>B-R13c</td>
<td>eGFR: Cockcroft-Gault</td>
<td>For estimating chemotherapy and drug dosages. Within 24 hours unless rapidly changing creatinine concentrations or fluid balance</td>
<td>None (inferred from British National Formulary) [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-R13d</td>
<td>Iohexol GFR</td>
<td>72 hours to avoid contamination (based on half-life of iohexol of two hours)</td>
<td>Krutzén E et al. J Lab Clin Med 1984;104:955–961.17 [Level of evidence – GPP.]</td>
</tr>
</tbody>
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### 2.2 Bone (refers to the measurement of the bone profile, unless otherwise stated)

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<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>B-B1</td>
<td>Non-acute setting unless there are other clinical indications</td>
<td>Testing at three-monthly intervals</td>
<td>Consensus opinion of the relevant expert working group</td>
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<td>[Level of evidence – GPP.]</td>
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<tr>
<td>B-B2</td>
<td>Acute settings</td>
<td>Testing at 48-hour intervals</td>
<td>Consensus opinion of the relevant expert working group</td>
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<td>[Level of evidence – GPP.]</td>
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<tr>
<td>B-B3</td>
<td>Acute hypo/ hypercalcaemia, TPN and ITU patients</td>
<td>May require more frequent monitoring</td>
<td>Consensus opinion of the relevant expert working group</td>
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<td>[Level of evidence – GPP.]</td>
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<tr>
<td>B-B4</td>
<td>ALP and total protein in acute setting</td>
<td>Testing at weekly intervals. ALP may need checking more often, but probably only in the context of acute cholestatic changes. See Liver recommendations (section 2.3)</td>
<td>Consensus opinion of the relevant expert working group</td>
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<td>[Level of evidence – GPP.]</td>
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<tr>
<td>B-B5</td>
<td>Vitamin D request: no clinical signs and symptoms</td>
<td>Do not retest (whatever the result as there may be no indication to test in the first place)</td>
<td>Consensus opinion of the relevant expert working group</td>
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<td>[Level of evidence – GPP.]</td>
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</table>
| B-B6  | Vitamin D request: 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 et al. Lancet 2012;379:95–96.\(^\text{18}\)
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<tr>
<td>B-B7</td>
<td>Vitamin D request: cholecalciferol or ergocalciferol therapy for whatever clinical</td>
<td>Repeat after three to six months on recommended replacement</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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<td>indication, where baseline vitamin D concentration was low and where there is</td>
<td>dose</td>
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<td>underlying disease that might impact negatively on absorption</td>
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<tr>
<td>B-B8</td>
<td>Vitamin D request: calcitriol or alphacalcidol therapy</td>
<td>Do not measure vitamin D</td>
<td>Consensus opinion of the relevant expert working group (GPP) [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-B9</td>
<td>Biochemical testing in CKD-MBD: CKD stages 3–5</td>
<td>For stage 3b progressive, test bone profile every six months,</td>
<td>The Renal Association, 2015. [Level of evidence – GPP.]</td>
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<td>PTH at baseline and 25OHvitD at baseline</td>
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<td>For stage 4, test bone profile every three months, PTH every</td>
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<td>six months and 25OHvitD at baseline</td>
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<td>For stage 5, test bone profile every month, PTH every three</td>
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<td>months and 25OHvitD at baseline</td>
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<td>For stage 5D, test bone profile every month, PTH every three</td>
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<td>months and 25OHvitD at baseline</td>
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### 2.3 Liver (refers to the measurement of LFTs, unless otherwise stated)

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</table>
| B-L1 | Non-acute setting                                                                  | Testing at one- to three-month intervals             | Smellie S *et al.*. ACB Venture Publications, 2011.\(^\text{21}\) [Level of evidence – D.]
|      |                                                                                     |                                                     |                                                                        |
| 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 [Level of evidence – GPP.]
|      |                                                                                     |                                                     |                                                                        |
| B-L3 | GGT and conjugated bilirubin in acute setting                                       | Testing at weekly intervals                         | Consensus opinion of the relevant expert working group [Level of evidence – GPP.]
|      |                                                                                     |                                                     |                                                                        |
| 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 [Level of evidence – GPP.]
|      |                                                                                     |                                                     |                                                                        |
| B-L5 | Neonatal jaundice                                                                  | These recommendations must not be used in the management of neonatal jaundice | N/A                                                                   |
|      |                                                                                     |                                                     |                                                                        |
| B-L6 | Initiating or changing therapies for primary or secondary cardiovascular disease prevention (LFTs) | Three months                                        | NICE Clinical Knowledge Summary, 2019.\(^\text{22}\) [Level of evidence – C.]

\(^\text{21}\)\(^\text{22}\)
### Lipids (refers to the measurement of lipid profile [non-fasting], unless otherwise stated)

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<th>Ref</th>
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<tbody>
<tr>
<td>B-LP2</td>
<td>Higher risk cases for IHD assessment and those on stable treatment</td>
<td>One year</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-LP3</td>
<td>Initiating or changing therapies for primary or secondary prevention (include non-HDL cholesterol)</td>
<td>Three months</td>
<td>NICE Clinical Knowledge Summary, 2019.22 [Level of evidence – B.]</td>
</tr>
<tr>
<td>B-LP4</td>
<td>When assessing triglyceridaemia to see effects of changing diet and alcohol</td>
<td>One week</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-LP5</td>
<td>In patients on TPN or who have hypertriglyceridaemia-induced pancreatitis</td>
<td>One day</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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### 2.5 Endocrine related (for pregnancy-related endocrinology, see 2.12)

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<th>Ref</th>
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<tbody>
<tr>
<td>B-E1</td>
<td>Thyroid function testing in a healthy person in the absence of any clinical symptoms</td>
<td>Three years</td>
<td>Consensus opinion of the relevant expert working group&lt;br&gt;[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-E2</td>
<td>Hyperthyroid: monitoring of treatment in Graves’ disease</td>
<td>Follow up in first one to two months after radioactive iodine treatment for Graves’. Measure fT4 and total T3. If patient remains thyrotoxic, biochemical monitoring should continue at four- to six-week intervals&lt;br&gt;Following thyroidectomy for Graves’ disease (and commencement of levothyroxine), serum TSH should be measured six to eight weeks post-op</td>
<td>Bahn Chair RS et al. Thyroid 2011;21:593–646. [Level of evidence D – 1/+00 = strong recommendation but weak evidence.]</td>
</tr>
<tr>
<td>B-E3</td>
<td>Hyperthyroid: monitoring of treatment in toxic multinodular goitre and toxic adenoma</td>
<td>Follow up in first one to two months after radioactive iodine treatment for toxic multinodular goitre and toxic adenoma. Measure fT4 and total T3 and TSH. Should be repeated at one- to two-month intervals until stable results, and then annually thereafter&lt;br&gt;Following surgery for toxic multinodular goitre and start of thyroxine therapy, TSH should be measured one to two monthly until stable and annually thereafter&lt;br&gt;Following surgery for toxic adenoma, TSH and fT4 concentrations should be measured four to six weeks post-op</td>
<td>Bahn Chair RS et al. Thyroid 2011;21:593–646. [Level of evidence D – 1/+00 = strong recommendation but weak evidence.]</td>
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<tr>
<td>B-E4</td>
<td>UK Thyroid guidelines</td>
<td>TFTs should be performed every four to six weeks for at least six months following radioiodine treatment. Once fT4 remains in reference range then frequency of testing should be reduced to annually. Lifelong annual follow up is required. Indefinite surveillance required following radioiodine or thyroidectomy for the development of hypothyroidism or recurrence of hyperthyroidism. TFTs should be assessed four to eight weeks post-treatment, then three monthly for up to one year, then annually thereafter. TFTs should be performed every four to six weeks after commencing thionamides. Testing at three-monthly intervals is recommended once maintenance dose achieved. In patients treated with 'block and replace', assess TSH and T4 at four- to six-weekly intervals, then after a further three months once maintenance dose achieved, then six monthly thereafter.</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006. [Level of evidence – B.]</td>
</tr>
<tr>
<td>B-E5</td>
<td>Hypothyroidism: monitoring treatment</td>
<td>The minimum period to achieve stable concentrations after a change of dose of thyroxine is two months and TFTs should not normally be assessed before this period has elapsed. Patients stabilised on long-term thyroxine therapy should have serum TSH checked annually. An annual fT4 should be performed in all patients with secondary hypothyroidism stabilised on thyroxine therapy.</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006. [Level of evidence – B.]</td>
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<tr>
<td>B-E6</td>
<td>Monitoring adult subclinical hyperthyroidism</td>
<td>If a serum TSH below reference range but &gt;0.1 mU/L is found, then the measurement should be repeated one to two 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 three- to six-month repeat interval is appropriate unless the patient is elderly or has underlying vascular disease. If treatment is not undertaken, then serum TSH should be measured in the long term every six to 12 months, with follow up with fT4 and fT3 if serum TSH result is low.</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006. [Level of evidence – B.]</td>
</tr>
<tr>
<td>B-E7</td>
<td>Monitoring adult subclinical hypothyroidism</td>
<td>Patients with subclinical hypothyroidism should have the pattern confirmed within three to six months to exclude transient causes of elevated TSH. Subjects with subclinical hypothyroidism who are ATPOab positive should have TSH and fT4 checked annually. Subjects with subclinical hypothyroidism who are ATPOab neg should have TSH and fT4 checked every three years.</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006. [Level of evidence – B.]</td>
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<tr>
<td>B-E8</td>
<td>Follow up of patients who have had differentiated (papillary and follicular) thyroid carcinoma and a total thyroidectomy and 131I ablation</td>
<td>TSH and fT4 should be measured as dose of levothyroxine increases (every six weeks) until the serum TSH is &lt;0.1 mIU/L. Thereafter, they should be measured annually unless clinically indicated/pregnant. Samples for Tg should not be collected sooner than six weeks post-thyroidectomy or 131I ablation/therapy. TSH, fT4/fT3 (whichever is being supplemented) and TgAb should be requested when Tg is measured. If TgAb are detectable, measurement should be repeated every six months.</td>
<td>British Thyroid Association, Royal College of Physicians, 2014. [Level of evidence – C.]</td>
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<tr>
<td>B-E9</td>
<td>Follow up of patients who have had medullary thyroid cancer and surgical resection</td>
<td>A baseline CEA and fasting calcitonin should be taken prior to operation. Postoperative samples should be measured no earlier than 15 days after thyroidectomy and plasma calcitonin concentrations are most informative six months after surgery&lt;br&gt;At least four measurements of calcitonin over a two- to three-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&lt;br&gt;Calcitonin monitoring should continue lifelong&lt;br&gt;TFTs should be measured as per guidance for hypothyroidism</td>
<td>British Thyroid Association, Royal College of Physicians, 2014.26&lt;br&gt;Laure Giraudet A et al. Eur J Endocrinol 2008;158: 239–246.27</td>
</tr>
<tr>
<td>B-E10</td>
<td>Anaplastic thyroid cancer</td>
<td>There is no need for any monitoring of thyroid function unless patient is on thyroid replacement, then as per hypothyroidism</td>
<td>British Thyroid Association, Royal College of Physicians, 2014.26</td>
</tr>
<tr>
<td>B-E11</td>
<td>Patients on amiodarone</td>
<td>Should have thyroid function tested before commencing treatment and then should be routinely monitored every six months thereafter while on treatment and up to 12 months after cessation of therapy</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006.25</td>
</tr>
<tr>
<td>B-E12</td>
<td>Patients on lithium</td>
<td>Thyroid function tested before commencing treatment and then should be routinely monitored every six to 12 months while on treatment</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006.25</td>
</tr>
<tr>
<td>B-E13</td>
<td>Progesterone testing in women with prolonged irregular menstrual cycles</td>
<td>Testing weekly in patients with irregular cycle from day 21 until next menstrual period</td>
<td>NICE. CG156, 2013.28</td>
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<tr>
<td>B-E14</td>
<td>Diagnosing premature ovarian insufficiency in women aged under 40 years with possible menopausal symptoms</td>
<td>Two tests four to six weeks apart in women with possible early or premature menopause</td>
<td>NICE NG23 2019.29 [Level of evidence – A.]</td>
</tr>
<tr>
<td>B-E17</td>
<td>Screening for diabetes in asymptomatic patients</td>
<td>Adults &lt;45 years old with normal weight and no risk factor: screening not recommended Adults &gt;45 years old with normal weight (BMI &lt;25 kg/m²) and no risk factor*: three years Adults &gt;18 years old with BMI ≥25 kg/m² and 1 risk factor*: three years, if result is normal *Risk(s) factors listed in Table 4 of Diabetes Care 2012;35(S1):S11–S63.32 [Level of evidence – B.] [Level of evidence – GPP.] [Level of evidence – B.]</td>
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<tr>
<td>B-E18</td>
<td>Diagnosing diabetes using HbA1c in an asymptomatic patient (not to be used in children or young adults)</td>
<td>Diagnosis should not be made on the basis of a single abnormal plasma glucose or HbA1c value. At least one additional HbA1c or plasma glucose test result with a value in the diabetic range is required within two weeks of the initial measurement, either fasting, from a random (casual) sample, or from the OGTT</td>
<td>WHO, 2011.33 [Level of evidence – B.]</td>
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<tr>
<td>B-E19</td>
<td>HbA1c monitoring of patients with type 2 diabetes</td>
<td>Two to six-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 three 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</td>
<td>NICE. NG28, 2015.34 [Level of evidence – B.]</td>
</tr>
<tr>
<td>B-E20</td>
<td>Diagnosis of male androgen deficiency</td>
<td>Repeat testosterone measurement to confirm diagnosis recommended</td>
<td>Bhasin S et al. J Clin Endocrinol Metab 2010;95:2536–2559.35 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-E22</td>
<td>Female androgen excess</td>
<td>If testosterone measurement found to be raised by an immunoassay method, confirm measurement with a LCMS method Thereafter, measurement should be repeated yearly</td>
<td>Martin KA et al. J Clin Endocrinol Metab 2008;93:1105–1120.37 Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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<tr>
<td>B-E23</td>
<td>Oestradiol</td>
<td>No evidence, guideline or consensus exists for repeat frequency</td>
<td>[Level of evidence – GPP.]</td>
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<td>For patients undergoing IVF samples may be taken daily</td>
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<td>For patients receiving implant treatment (HRT) a pre-implant value is checked to avoid tachyphylaxis. Frequency depends on frequency of implant</td>
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<td></td>
<td>For patients receiving implant treatment a pre-implant value is checked to avoid tachyphylaxis</td>
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<tr>
<td>B-E24</td>
<td>Growth hormone deficiency</td>
<td>IGF-1 is the most useful marker for monitoring and should be measured at least yearly. Assessment should be performed no earlier than six weeks following a dose change</td>
<td>Ho KK et al. Eur J Endocrinol 2007;157:695–700,38 [Level of evidence – D.]</td>
</tr>
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<td>Acromegaly: medical therapy</td>
<td>Measure both GH and IGF-1 at three months. If normal, then at annual follow up</td>
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<td>Acromegaly: medical therapy using GH receptor antagonists</td>
<td>Measure only IGF-1 at six-monthly intervals after dose titration. Monthly monitoring of LFTs for first six months</td>
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<td>Acromegaly: post-radiotherapy</td>
<td>Measurement of GH and IGF-1 annually</td>
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<tr>
<td>B-C1</td>
<td>Using troponin: general</td>
<td>MRI largely dependent on the manufacturers’ assay being used and the clinical scenario. MRI should be implemented according to the local protocol used</td>
<td>Wu AHB et al. Clin Chem 2018;64:645–655.40 [Level of evidence – A.]</td>
</tr>
<tr>
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<td>Using troponin: ACS</td>
<td>Algorithms that have been developed using high-sensitivity troponin assays will usually require several samples. A second sample is required one to two hours after presentation. The sensitivity for myocardial infarction is almost 100% For standard troponin assays: if the first blood sample for troponin is not elevated, a second sample should be obtained after six to nine hours. Sometimes a third sample after 12–24 hours is required</td>
<td>Boeddinghaus J et al. Clin Chem 2018;64:1347–1360.41 [Level of evidence – A.]</td>
</tr>
<tr>
<td></td>
<td>Using troponin: renal failure</td>
<td>Concentrations of troponin are usually increased in CKD patients (especially using high sensitivity assays). Serial samples will be required if suspected ACS as above</td>
<td>Thygesen K et al. Eur Heart J 2010;31:2197–2204.43 [Level of evidence – A.]</td>
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<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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<tr>
<td>B-C2</td>
<td>Using BNP (NT-ProBNP):</td>
<td>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</td>
<td>NICE. CG108, 2010. [Level of evidence – A.]</td>
</tr>
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<td>Primary care (heart failure triage)</td>
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<td></td>
<td>Secondary care (acute failure)</td>
<td>In people presenting with new suspected acute heart failure, use a single measurement of serum natriuretic peptides (BNP or NT-ProBNP)</td>
<td>NICE. CG187, 2014. [Level of evidence – A.]</td>
</tr>
<tr>
<td></td>
<td>Therapeutic guidance in heart failure</td>
<td>Consider measuring NT-ProBNP as part of a treatment optimisation protocol only in a specialist care setting for people aged under 75 who have heart failure with reduced ejection fraction and an eGFR above 60 ml/min/1.73 m²</td>
<td>NICE. NG106, 2018. [Level of evidence – A.]</td>
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<tr>
<td>B-G1</td>
<td>Coeliac serology in known adult patients on follow up</td>
<td>IgA tTG can be used to monitor response to a gluten-free diet. Retesting at six to twelve months depending on pre-treatment value</td>
<td>Wolters Kluwer, 2019.69 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-G3</td>
<td>Faecal calprotectin</td>
<td>MRI is six months</td>
<td>van Rheenen PF et al. BMJ 2010;341:c3369.51 [Level of evidence – A.]</td>
</tr>
<tr>
<td></td>
<td>Faecal calprotectin being used to discriminate irritable bowel syndrome from inflammatory bowel disease in primary care using the York Faecal Calprotectin Care Pathway</td>
<td>Change due to York pathway If initial sample is &lt;100 mcg/g, then retesting not required If initial sample is &gt;100 mcg/g, the MRI is two weeks. If repeat sample is &gt;250 mcg/g, refer to gastroenterology urgently</td>
<td>Turvill J et al. Frontline Gastroenterol 2018;9:285–294.52 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-G4</td>
<td>Trace elements (copper, zinc, selenium) in the monitoring of nutrition support</td>
<td>Baseline then every two to four weeks depending upon results</td>
<td>NICE.CG32, 2006.53 [Level of evidence – A.]</td>
</tr>
<tr>
<td>B-G5</td>
<td>Ferritin monitoring for haemochromatosis</td>
<td>EASL recommends an initial retesting interval of three months, but this should be tested more frequently as ferritin approaches normal range BCSH 2000 recommends monthly ferritin during venesection</td>
<td>European Association for the Study of the Liver. J Hepatol 2010;53:3–22.54 British Society for Haematology, 2018.55 [Level of evidence – B.]</td>
</tr>
<tr>
<td>B-G6</td>
<td>Iron deficiency diagnosis</td>
<td>Repeat iron measurement not required unless doubt regarding diagnosis</td>
<td>Goddard AF et al. Gut 2011;60:1309–1316.56 [Level of evidence – D.]</td>
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| B-G7  | Iron deficiency diagnosis                              | Check FBC two weeks post-iron therapy  
Once Hb normalised check FBC after two months                                                                                      | GAIN, 2015.57                              |
|       |                                                        |                                                                                                                                             | [Level of evidence – D.]                    |
| B-G8  | Iron status in CKD                                     | Monitor iron status no earlier than one week after receiving IV iron and at intervals of one to three months routinely                      | NICE. NG8, 2015.58                         |
|       |                                                        |                                                                                                                                             | [Level of evidence – A.]                    |
| B-G9  | Iron profile/ferritin in a normal patient             | One year                                                                                                                                     | NICE. CG32, 2006.53                        |
|       |                                                        |                                                                                                                                             | [Level of evidence – A.]                    |
|       |                                                        |                                                                                                                                             | [Level of evidence – D.]                    |
| 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  
However, vitamin B12 can be measured one to two months after starting treatment if there is no response  
Check FBC and reticulocyte count ten days post-treatment for response. Once Hb is normalised, the MRI is eight weeks | Clinical Knowledge Summary, 2019.60  
GAIN, 2015.57                              |
|       |                                                        |                                                                                                                                             | [Level of evidence – D.]                    |

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 CG32 Nutrition support in adults.53
### 2.8 Specific proteins

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<tbody>
<tr>
<td>B-SP2</td>
<td>Patients with no features of plasma cell dyscrasia (e.g. anaemia, bone fracture or pain located in bone, suppression of other immunoglobulin classes, renal impairment) and a band of &lt;15 g/L</td>
<td>Annual serum protein electrophoresis and quantitation by densitometry without need for further immunofixation is recommended</td>
<td>Smellie WS et al. <em>J Clin Pathol</em> 2005;58:1016–1024.23 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-SP3</td>
<td>Monoclonal gammopathy of undetermined significance</td>
<td>Test at three- to four-monthly intervals within the first year of identification. Then six to 12 monthly as long as no symptoms of progression</td>
<td>Bird J et al. <em>Br J Haematol</em> 2009:147;22–42.51 [Level of evidence – D.]</td>
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## 2.9 Tumour markers

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<tbody>
<tr>
<td>B-TM4</td>
<td>Using CA125 in diagnostic strategies</td>
<td>Retesting CA125 when imaging is negative within one month</td>
<td>NICE. CG122, 2011.67 [Level of evidence – A.]</td>
</tr>
<tr>
<td>B-TM6</td>
<td>Monitoring disease recurrence with CA19.9</td>
<td>One month</td>
<td>No available evidence. All Wales Consensus Group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-TM7</td>
<td>PSA screening</td>
<td>When first result is raised, repeat once in the following 6 weeks to assess the trend</td>
<td>Public Health England, 2019.68 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-TM8</td>
<td>Monitoring disease with PSA</td>
<td>Every three months for first one to two years Every six months for two years Annually thereafter</td>
<td>Smellie WS et al. J Clin Pathol 2006;59:1116.69 [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-TM9</td>
<td>Monitoring disease recurrence with CA15.3</td>
<td>Two months</td>
<td>Molina R et al. Tumour Biol 2005;26;281–293.70 [Level of evidence – B.]</td>
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<tr>
<td>B- TM10</td>
<td>Serum β-hCG (tumour marker)</td>
<td>After evacuation of a molar pregnancy, hCG concentration should be monitored every week until normalisation then every month during the first year</td>
<td>Bidart JM et al. <em>Clin Chem</em> 1999;45:1695–1707.71 [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-TM11</td>
<td>Serum β-hCG (tumour marker)</td>
<td>After resection, prolonged marker half-life (&gt;3 days for hCG) is a reliable indicator of residual tumour and a significant predictor of survival</td>
<td>Bidart JM et al. <em>Clin Chem</em> 1999;45:1695–1707.71 [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-TM12</td>
<td>Serum β-hCG (tumour marker)</td>
<td>If rate of change in tumour marker concentration changes velocity, an urgent repeat to confirm the result is reasonable</td>
<td>Sturgeon CM et al. <em>Clin Chem</em> 2008;54:1935–1939.72 [Level of evidence – A.]</td>
</tr>
</tbody>
</table>
2.10 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, 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.\textsuperscript{73}

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. Therefore, the half-lives will be shorter or longer, respectively, and the five 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.

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<tr>
<td>B-TD1</td>
<td>Anticonvulsant drugs (carbamazepine, phenytoin)</td>
<td>Five half-lives after dosage change (four to five 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 two to three months after commencing therapy</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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<tr>
<td>B-TD2</td>
<td>Digoxin</td>
<td>Five half-lives after dosage change (i.e. approx. seven 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 four hours depending on clinical condition and therapy</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-TD3</td>
<td>Aminoglycoside antibiotics (gentamicin, tobramycin)</td>
<td>Every 24 hours at start of therapy on high-dose parenteral regimens, less frequently when stable. Especially important in the elderly, patients with impaired renal function and those with cystic fibrosis. This only applies to once-daily dosing. If patient is on multiple doses per day, refer to local guidance</td>
<td>Consult local hospital guidelines [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-TD4</td>
<td>Immunosuppressive drugs (ciclosporin, tacrolimus, sirolimus)</td>
<td>Initially three 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</td>
<td>Baker R et al. The Renal Association, 2011. [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-TD5</td>
<td>Theophylline</td>
<td>Five half-lives after dosage change (i.e. approx. two days) during initial dose optimisation on oral regimens. Note smoking significantly reduces the half-life. Daily on IV aminophylline. In overdose situations requiring haemodialysis, every four hours</td>
<td>Consensus opinion of the relevant expert working group. [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-TD6</td>
<td>Methotrexate (high dose IV)</td>
<td>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 hours or according to local protocol)</td>
<td>See product literature. Plard C et al. Cancer Chemother Pharmacol 2007;60: 609–620. [Level of evidence – D.]</td>
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<tr>
<td>B-TD7</td>
<td>Lithium</td>
<td>Days four to seven of treatment then every week until dosage has remained constant for four weeks, then every three months on stabilised regimens. Check concentration when preparation changed, when fluid intake changes or when interacting drugs are added/withdrawn. 100% renal clearance, so is dependent on renal function. Up to every four hours in overdose situations requiring intensive therapy</td>
<td>Joint Formulary Committee. <em>British National Formulary (77th edition)</em>, 2019. [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-TD8</td>
<td>Clozapine</td>
<td>Induces its own metabolism and is induced further by smoking. Approximately four days to reach new steady-state after dose change or smoking cessation with potentially fatal consequences due to the rapid increase to toxic concentrations</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.]</td>
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### 2.11 Occupational/toxicology

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| B-O1  | Occupational lead exposure (chronic)         | Initial blood lead concentration before commencing work or within 14 days of starting  
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  
If the blood lead concentration is ≥30 μg/dL in adult males (≥20 μg/dL in women of childbearing age), monitor at least every six months  
If the blood lead concentration is ≥40 μg/dL in adult males (≥25 μg/dL in women of childbearing age), monitor at least every three months  
If the blood lead concentration is ≥60 μg/dL in adult males (≥30 μg/dL in women of childbearing age), repeat measurement of blood lead within two weeks | Health and Safety Executive Books, 2002.[77]  
[Level of evidence – D.]                                                                 |
| B-O2  | Acute lead poisoning in adults              | If baseline blood lead concentration is <50 μg/dL and the patient is asymptomatic and not pregnant, repeat blood lead concentration after two weeks following removal from exposure  
If baseline blood lead concentration is ≥50 μg/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 one week after the end of chelation treatment | TOXBASE.[78]  
[Level of evidence – D.]                                                                 |
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<tr>
<td>B-O3</td>
<td>Acute lead poisoning in children</td>
<td>If baseline blood lead concentration is 10–50 μg/dL, repeat blood lead measurement in one month following removal from exposure If baseline blood lead concentration is &gt;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 one week after the end of treatment</td>
<td>TOXBASE. [Level of evidence – D.].</td>
</tr>
<tr>
<td>B-O4</td>
<td>Amphetamine toxicity</td>
<td>Retesting is not indicated in the same acute episode</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.].</td>
</tr>
<tr>
<td>B-O5</td>
<td>Benzodiazepine toxicity</td>
<td>Retesting is not indicated in the same acute episode</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.].</td>
</tr>
<tr>
<td>B-O6</td>
<td>Cocaine toxicity</td>
<td>Retesting is not indicated in the same acute episode</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.].</td>
</tr>
<tr>
<td>B-O7</td>
<td>Opiate toxicity including morphine, codeine and heroin</td>
<td>Retesting is not indicated in the same acute episode</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.].</td>
</tr>
<tr>
<td>B-O8</td>
<td>Opioid toxicity including methadone</td>
<td>Retesting is not indicated in the same acute episode</td>
<td>Consensus opinion of the relevant expert working group [Level of evidence – GPP.].</td>
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## 2.12 Pregnancy related

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<tr>
<td>B-P1</td>
<td>Urine β-hCG (pregnancy)</td>
<td>Urine pregnancy test can be repeated at three days after a negative result or approx. 28 days after period commences</td>
<td>Manufacturer’s instructions [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-P2</td>
<td>Serum β-hCG (pregnancy)</td>
<td>Serum β-hCG test: do not repeat if positive. Repeat after three days if negative and no menstrual period has occurred</td>
<td>Serum β-hCG doubling time = 1.5–2 days [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-P3</td>
<td>Serum β-hCG (ectopic pregnancy)</td>
<td>48-hour repeat interval</td>
<td>NICE. NG126, 2019.⁷⁹ [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-P4</td>
<td>Serum β-hCG (tumour marker)</td>
<td>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</td>
<td>Bidart JM et al. Clin Chem 1999;45:1695–1707.⁷¹ [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-P5</td>
<td>LFTs in obstetric cholestasis</td>
<td>Once obstetric cholestasis is diagnosed, it is reasonable to measure LFTs weekly until delivery. Postnatally, LFTs should be deferred for at least 10 days</td>
<td>RCOG. Obstetric Cholestasis: Green-top Guideline No 43, 2011.⁸⁰ [Level of evidence – D.]</td>
</tr>
<tr>
<td>B-P6</td>
<td>Bile acids in obstetric cholestasis</td>
<td>Weekly monitoring. Twice-weekly monitoring advised in later weeks if clinical state changing</td>
<td>No evidence available but reflects expert opinion and practice [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>B-P7</td>
<td>Measurement of urate in pre-eclampsia</td>
<td>Awaiting expert advice whilst not admitted: twice-weekly urate</td>
<td>No evidence but reflects the practice of tertiary centre of excellent [Level of evidence – GPP.]</td>
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| B-P8  | Urine protein in pre-eclampsia                         | At each antenatal visit to screen for pre-eclampsia  
Once diagnosed do not repeat quantification of proteinuria  
Only repeat if clinically indicated, for example, if new symptoms and signs develop or if there is uncertainty over diagnosis | NICE. CG62, 2008.81  
NICE. NG133, 2019.82  
[Level of evidence – B.] |
| B-P9  | LFT/renal in pre-eclampsia                             | At least daily when the results are abnormal but more often if the clinical condition  
If mild hypertension*, perform tests twice weekly  
If moderate hypertension*, perform tests three times a week  
If severe hypertension*, perform tests three times a week  
*See source guidelines for definitions of hypertension | RCOG. Green-top Guideline No 10A, 2006.83  
NICE. NG133, 2019.82  
[Level of evidence – B.] |
| B-P10 | Monitoring of thyrotoxicosis treatment in pregnant women (UK) | In women taking anti-thyroid drugs, TFTs should be performed prior to conception, at time of confirmation 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, 2006.25  
[Level of evidence – C.] |
| B-P11 | Monitoring of thyrotoxicosis treatment in pregnant women (USA) | fT4 and TSH should be monitored approximately every two to six weeks in women treated with anti-thyroid drugs in pregnancy | Stagnaro-Green A et al. Thyroid 2011;21:1081–1125.84  
[Level of evidence – C.] |
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<tr>
<td>B-P12</td>
<td>Pregnancy subclinical hypothyroidism</td>
<td>Women with subclinical hypothyroidism who are not initially treated should be monitored for progression to overt hypothyroidism. Serum fT4 and TSH should be measured every four weeks until 16–20 weeks gestation and at least once between 26–32 weeks. (Euthyroid women [not receiving LT4] who are anti-thyroid antibody positive should be monitored during pregnancy. Serum fT4 and TSH should be measured every four weeks until 16–20 weeks gestation and at least once between 26 and 32 weeks)</td>
<td>Stagnaro-Green A et al. <em>Thyroid</em> 2011;21:1081–1125. [Level of evidence – C.]</td>
</tr>
<tr>
<td>B-P13</td>
<td>Women with diabetes who are planning to become pregnant</td>
<td>Monthly measurement of HbA1C</td>
<td>NICE. NG3, 2015. [Level of evidence – A.]</td>
</tr>
<tr>
<td>B-P14</td>
<td>Assessing glycaemic control using HbA1c in pregnancy</td>
<td>HbA1C should not be used routinely for assessing glycaemic control in the second and third trimesters of pregnancy however consider measuring HbA1C for women with pre-existing diabetes to assess risk to pregnancy</td>
<td>NICE. NG3, 2015. [Level of evidence – A.]</td>
</tr>
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</table>
| B-P15 | For management of hyponatraemia in labour and the immediate postpartum period, women require sodium monitoring if they are: | Refers to measurement of sodium

**Women on insulin infusions:**

- MRI is 4 hours

**During labour:**

- Sodium >129 mmol/L
- MRI is 8 hours
- Sodium 129–125 mmol/L
- MRI is 4 hours
- Sodium <125 mmol/L
- MRI is 2 hours

**Delivery or completion of oxytocin infusion:**

- Sodium >129 mmol/L
- Retesting not required
- Sodium 129–125 mmol/L AND asymptomatics
- MRI is 4 hours
- Sodium <125 mmol/L OR symptomatic <130 mmol/L
- MRI is 2 hours

To refer to measurement of sodium
<p>| Refers to measurement of sodium | GAIN, 2017. [Level of evidence – A.] |</p>
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<tr>
<td>B-P16</td>
<td>Women with type 1 diabetes are three-times more likely to develop post-partum thyroid dysfunction</td>
<td>Serum TSH, fT4 and thyroid peroxidase antibody status should be established preconception, at booking when pregnant and at three months post-partum</td>
<td>Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation, 2006. [Level of evidence – C.]</td>
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### 2.13 Paediatric related

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<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-CH1</td>
<td>HbA1C monitoring in children and young people with type 1 diabetes</td>
<td>Two months</td>
<td>NICE. NG18, 2004.(^{87}) [Level of evidence – A.]</td>
</tr>
</tbody>
</table>
3 Haematology recommendations

3.1 Haematology general

Note: FBC refers to the measurement of Hb, WCC and Plt count unless otherwise stated.

<table>
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<tr>
<th>Ref</th>
<th>Clinical situation</th>
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</thead>
<tbody>
<tr>
<td>FBC</td>
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</tr>
<tr>
<td>H-FBC1</td>
<td>Normal follow up</td>
<td>A repeat would be indicated on clinical grounds if there were a significant change in the patient’s condition</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-FBC2</td>
<td>Inpatient monitoring of a stable patient</td>
<td>An inpatient with a normal admission FBC should not have a repeat within the average length of stay of four days</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-FBC3</td>
<td>Inpatient monitoring of an unstable patient who is not actively bleeding or a patient receiving cytotoxic drugs</td>
<td>Not usually required more than once daily</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-FBC4</td>
<td>Patients with major bleeding</td>
<td>Repeat interval should be determined by the clinical situation. Should be repeated at least every hour for massive haemorrhage</td>
<td>Thomas D et al. Anaesthesia 2010;65:1153–1161.89 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-FBC5</td>
<td>Pregnant on haematinics supplements (iron, folate, B12)</td>
<td>Repeat after at least 14 days</td>
<td>BCSH, 2011.90 [Level of evidence – B.]</td>
</tr>
<tr>
<td>H-FBC6</td>
<td>Routine pregnancy monitoring</td>
<td>At booking, 28 weeks and postpartum</td>
<td>NICE. CG62, 2008.81 [Level of evidence – A.]</td>
</tr>
</tbody>
</table>
<pre><code>                                                             |                                                                                                      |                                                                        | BCSH, 2011.90 [Level of evidence – B.]                                   |
</code></pre>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>H-FBC7</td>
<td>Hypertensive disorders of pregnancy*&lt;br&gt;*FBC in combination with renal and liver function</td>
<td>Once only if moderate antenatal gestational hypertension (&lt;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</td>
<td>NICE. NG133, 2019&lt;sup&gt;82&lt;/sup&gt; [Level of evidence – A.]</td>
</tr>
<tr>
<td>H-FBC8</td>
<td>Inpatients with suspected platelet alloantibodies or receiving HLA matched platelets</td>
<td>Repeat one hour after completion of platelet transfusion</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-FBC9</td>
<td>Patients with anaemia of chronic kidney disease</td>
<td>Every two to four weeks in the induction phase of ESA therapy and every one to three months in the maintenance phase of ESA therapy</td>
<td>NICE. NG8, 2015&lt;sup&gt;58&lt;/sup&gt; [Level of evidence – A.]</td>
</tr>
<tr>
<td><strong>ESR</strong></td>
<td></td>
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</tr>
<tr>
<td>H-ESR1</td>
<td>Temporal arteritis/polymyalgia rheumatica</td>
<td>Every three months following first month of treatment</td>
<td>Dasgupta B et al. Rheumatology 2010;49:186–190.&lt;sup&gt;91&lt;/sup&gt; [Level of evidence – B.]</td>
</tr>
<tr>
<td>H-ESR2</td>
<td>Rheumatoid arthritis</td>
<td>Every month until treatment has controlled the disease (NICE CG79 recommends use of CRP)</td>
<td>NICE. CG79, 2009&lt;sup&gt;92&lt;/sup&gt; [Level of evidence – A.]</td>
</tr>
</tbody>
</table>
3.2 Haematology coagulation

Notes: Basic CS refers to the combined measurement of PT and APTT unless otherwise stated. PT expressed as time in seconds. APTT expressed as time in seconds and/or as a ratio with normal. CFA refers to the measurement of antigen and/or activity of a coagulation factor (procoagulant or anticoagulant). Coagulation factor inhibitor testing including the use of a Bethesda assay or equivalent, other inhibitor screens, ELISA or trough factor measurement.

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
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</thead>
<tbody>
<tr>
<td>H-CS1</td>
<td>Patients with major bleeding</td>
<td>Repeat interval should be determined by the clinical situation and the coagulation screen must include fibrinogen. Should be repeated at least every hour for massive haemorrhage</td>
<td>Thomas D et al. Anaesthesia 2010;65:1153–1161.89 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-CS2</td>
<td>Patients with acute coagulopathy</td>
<td>Usually no more than once daily if not receiving coagulation factors and no active bleeding</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>PT</th>
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<tbody>
<tr>
<td>H-PT1</td>
<td>Patients with chronic liver disease</td>
<td>Every three months if otherwise stable</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
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<thead>
<tr>
<th>INR</th>
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<tbody>
<tr>
<td>H-INR1</td>
<td>Patients being initiated on VKA</td>
<td>No more than once daily</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-INR2</td>
<td>Unstable inpatient on VKA</td>
<td>No more than once daily</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-INR3</td>
<td>Stable outpatient on VKA</td>
<td>Usually no more than once weekly and up to 12 weeks when very stable</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Clinical situation</td>
<td>Recommendation</td>
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<tr>
<td>H-INR4</td>
<td>Patient requiring urgent reversal of VKA (or to treat any acquired deficiency of vitamin K dependent coagulation factors) with vitamin K</td>
<td>Repeat only after at least six hours following IV dose and the following day after an oral dose</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-INR5</td>
<td>Patient requiring urgent reversal of VKA with a four-factor PCC</td>
<td>Repeat within an hour of administration</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>APTTT</td>
<td></td>
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<tr>
<td>H-APTT1</td>
<td>Patient receiving intravenous infusion of unfractionated heparin</td>
<td>Repeat 6 hours after dose adjustment (2 hours if previous APTT ratio &gt;5.0) and daily when APTT in the target range</td>
<td>Raschke RA et al. Ann Intern Med 1993;119:874–881.93 [Level of evidence – B/C.]</td>
</tr>
<tr>
<td>H-APTT2</td>
<td>Patients receiving intravenous infusion of a parenteral direct thrombin inhibitor (bivalirudin, argatroban)</td>
<td>Repeat two hours after each dose adjustment then daily when in the target range</td>
<td>Summary of product characteristics [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Clauss fibrinogen assay</td>
<td></td>
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</tr>
<tr>
<td>H-F1</td>
<td>Patients with acute coagulopathy</td>
<td>Usually no more than daily if not receiving coagulation factors and no active bleeding</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-F2</td>
<td>Patients with major bleeding</td>
<td>Repeat interval should be determined by the clinical situation. Should be repeated at least every hour in massive haemorrhage</td>
<td>Thomas D et al. Anaesthesia 2010;65:1153–1161.99 [Level of evidence – D.]</td>
</tr>
<tr>
<td>Anti-Xa assay</td>
<td></td>
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<tr>
<td>H-Anti-Xa1</td>
<td>Patient on therapeutic dose of LMWH with significant renal impairment, extreme weight, pregnancy or other indication for measurement</td>
<td>At least three days after initiation or dose adjustment, then no more than once weekly if the dose is unchanged</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
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<tr>
<td>LA screen</td>
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<tr>
<td>H-LA2</td>
<td>Investigation for antiphospholipid syndrome after completion of anticoagulation</td>
<td>At least seven days after stopping anticoagulation</td>
<td>Keeling D <em>et al.</em> <em>Br J Haematol</em> 2012;157:47–58.94 [Level of evidence – B.]</td>
</tr>
<tr>
<td>CFA</td>
<td></td>
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<tr>
<td>H-CF1</td>
<td>A patient under investigation for suspected coagulation factor deficiency</td>
<td>An abnormal result can be repeated for confirmation at a clinically appropriate interval</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>H-CF2</td>
<td>A patient receiving coagulation factor replacement therapy</td>
<td>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)</td>
<td>Consensus of the haematology working group [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Coagulation factor inhibitor testing</td>
<td></td>
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</tr>
<tr>
<td>H-CFI1</td>
<td>Surveillance in patients with severe haemophilia A or B</td>
<td>After every third factor ED or every three months (whichever is sooner) until 20 ED, then every three to six months until 150 ED (then one to two times per year in severe haemophilia A only)</td>
<td>Collins PW <em>et al.</em> <em>Br J Haematol</em> 2013;160:153–170.95 [Level of evidence – B/C.]</td>
</tr>
<tr>
<td>H-CFI2</td>
<td>Surveillance after change of factor concentrate in severe haemophilia A</td>
<td>Before the change and then twice in the first six months after the change</td>
<td>Collins PW <em>et al.</em> <em>Br J Haematol</em> 2013;160:153–170.95 [Level of evidence – B/C.]</td>
</tr>
<tr>
<td>H-CFI3</td>
<td>Surveillance in patients with moderate or mild haemophilia A</td>
<td>Annually if exposed to factor concentrate or after intensive exposure (&gt;5 ED) or surgery</td>
<td>Collins PW <em>et al.</em> <em>Br J Haematol</em> 2013;160:153–170.95 [Level of evidence – C.]</td>
</tr>
<tr>
<td>Ref</td>
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</tr>
<tr>
<td>H-CFI5</td>
<td>After completion of successful ITT</td>
<td>Monthly for six months then every two months for up to a year</td>
<td>Collins PW et al. <em>Br J Haematol</em> 2013;160:153–170.95 [Level of evidence – C.]</td>
</tr>
</tbody>
</table>
3.3 **Haematology transfusion (general and screening group in PBLC)**

Note: Estimation of FMH refers to the measurement of FMH by Kleihauer and/or flow cytometry

<table>
<thead>
<tr>
<th>Ref</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Blood group and antibody screen</td>
<td></td>
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</tr>
<tr>
<td>H-BGAS1</td>
<td>A first-time patient prior to transfusion</td>
<td>A second sample should be requested prior to transfusion</td>
<td>Milkins C et al. <em>Transfus Med</em> 2013;23:3–35.97 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-BGAS2</td>
<td>A patient who has not had a transfusion or pregnancy within the previous three months</td>
<td>The original sample can be valid for up to three months</td>
<td>Milkins C et al. <em>Transfus Med</em> 2013;23:3–35.97 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-BGAS3</td>
<td>A patient who has had a transfusion or pregnancy within the previous three months</td>
<td>The original sample is valid for up to three days</td>
<td>Milkins C et al. <em>Transfus Med</em> 2013;23:3–35.97 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-BGAS4</td>
<td>A pregnant woman who requires blood on standby for obstetric emergencies (e.g. placenta praevia)</td>
<td>A sample may be considered valid for up to seven days</td>
<td>Milkins C et al. <em>Transfus Med</em> 2013;23:3–35.97 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-BGAS5</td>
<td>A chronically transfused patient with no red cell alloantibodies</td>
<td>A sample may be considered valid for up to seven days after individual risk assessment</td>
<td>Milkins C et al. <em>Transfus Med</em> 2013;23:3–35.97 [Level of evidence – D.]</td>
</tr>
<tr>
<td>H-BGAS6</td>
<td>A pregnant woman over 20 weeks gestation who has anti-D, -c or -K antibodies</td>
<td>Repeat with quantification of c and D antibodies, and anti-K by titration every four weeks until 28 weeks and then every two weeks until delivery</td>
<td>White J et al. <em>Transfus Med</em> 2016;26:246–263.98 [Level of evidence – C/D.]</td>
</tr>
<tr>
<td>Estimation of FMH</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>H-FMH1</td>
<td>An antenatal sensitising event in RhD-negative women after 20 weeks gestation who are at risk of developing RhD antibodies</td>
<td>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 two weeks</td>
<td>Qureshi H et al. <em>Transfus Med</em> 2014;24:8–20.99 [Level of evidence – C.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Clinical situation</td>
<td>Recommendation</td>
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<tr>
<td>H-FMH2</td>
<td>FMH &gt;4 ml in RhD-negative women after 20 weeks gestation who are at risk of developing RhD antibodies (RhD-positive baby or fetal RhD status unknown)</td>
<td>Repeat 48 hours after IV anti-D or 72 hours after IM anti-D and repeat process until no detectable fetal cells</td>
<td>Qureshi H et al. Transfus Med 2014;24:8–20.99 [Level of evidence – C.]</td>
</tr>
<tr>
<td>H-FMH3</td>
<td>After cell salvage in RhD-negative women</td>
<td>Check 30–45 minutes after reinfusion of salvaged cells then as per FMH1</td>
<td>Qureshi H et al. Transfus Med 2014;24:8–20.99 [Level of evidence – C.]</td>
</tr>
</tbody>
</table>
## Immunology recommendations

If no source is quoted, then the recommendation is based on the response from the RCPath SAC for immunology.

<table>
<thead>
<tr>
<th>Ref</th>
<th>Test</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>A3 ganglionic receptor antibody</td>
<td>Repeat testing once diagnosis is confirmed is of limited value</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-2</td>
<td>Acetyl choline receptor antibody</td>
<td>Frequency determined by clinical context. Every six months while on treatment</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-3</td>
<td>Adrenal cortex antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-4</td>
<td>aPL antibody</td>
<td>Once diagnosis is confirmed using BCSH guidelines, repeat testing is of limited value</td>
<td>Keeling D et al. Br J Haematol 2012;157:47–58.94 [Level of evidence – D.]</td>
</tr>
<tr>
<td>I-5</td>
<td>Alpha-1 antitrypsin genotype</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-6</td>
<td>AMPA receptor antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-7</td>
<td>Anti-nuclear antibody (HEP2)</td>
<td>Once diagnosis is established, repeat testing is of limited value</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-8</td>
<td>Aquaporin 4 antibodies (NMO) CSF</td>
<td>Repeat testing guided by clinical context and discussion with specialist laboratory service providing assay</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-9</td>
<td>Aquaporin 4 antibodies (NMO) serum</td>
<td>Repeat testing guided by clinical context and discussion with specialist laboratory service providing assay</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-10</td>
<td>Basal ganglia antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-11</td>
<td>Beta-2 microglobulin</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
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</tr>
<tr>
<td>I-12</td>
<td>Beta-2 glycoprotein I antibody</td>
<td>Once diagnosis is confirmed using BCSH guidelines, repeat testing is of limited value</td>
<td>Keeling D et al. Br J Haematol 2012;157:47–58.(^9^4) [Level of evidence – D.]</td>
</tr>
<tr>
<td>I-13</td>
<td>C3/4</td>
<td>90 days (earlier frequency of testing maybe required in exceptional cases)</td>
<td>Consensus of surveyed labs [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-14</td>
<td>C3 nephritic factor</td>
<td>Not routinely required if positive. Only allowed if C3 below reference range</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-15</td>
<td>Cardiac muscle antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-16</td>
<td>Cardiolipin antibody</td>
<td>Once diagnosis is confirmed using BCSH guidelines, repeat testing is of limited value</td>
<td>Keeling D et al. Br J Haematol 2012;157:47–58.(^9^4) [Level of evidence – D.]</td>
</tr>
<tr>
<td>I-17</td>
<td>CCP</td>
<td>Repeat testing once diagnosis is confirmed is of limited value</td>
<td>Consensus of surveyed labs [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-18</td>
<td>CD62 ligand shedding</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-19</td>
<td>Complement C1q</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>Tarzi MD et al. Clin Exp Immunol 2007; 149:513–516.(^1^0^1) [Level of evidence – D.]</td>
</tr>
<tr>
<td>I-20</td>
<td>Complement 1 inhibitor immunochemical</td>
<td>Only once to confirm; repeat testing limited to exceptional cases Generally, only performed if C4 is low or with compatible clinical information</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-21</td>
<td>Complement AP100</td>
<td>Only once to confirm Only allowed with compatible clinical information</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
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<tr>
<td>I-22</td>
<td>Complement C2</td>
<td>Only once to confirm</td>
<td>[Level of evidence – GPP.]</td>
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<td>Only allowed with compatible clinical information</td>
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<tr>
<td>I-23</td>
<td>Complement CH100</td>
<td>Only once to confirm</td>
<td>[Level of evidence – GPP.]</td>
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<td></td>
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<td>Only allowed with compatible clinical information</td>
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<tr>
<td>I-24</td>
<td>Complement factor B</td>
<td>Only once to confirm</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
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<td>Only allowed with compatible clinical information</td>
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<tr>
<td>I-25</td>
<td>Complement factor H</td>
<td>Only allowed with compatible clinical information</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-26</td>
<td>CSF oligoclonal</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-27</td>
<td>Cryoglobulin screen</td>
<td>After initial confirmation of cryoglobulin, which may require testing more than once, repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-28</td>
<td>Cryoglobulin type</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-29</td>
<td>dsDNA Ab ELISA</td>
<td>Every three to six months while on treatment</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-30</td>
<td>Endomysial antibody (IgA)</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only for confirmation of tTg positives</td>
<td></td>
</tr>
<tr>
<td>I-31</td>
<td>Endomysial antibody (IgG)</td>
<td>Only for patients with complete IgA deficiency and confirmation of positive tTG IgG Indicate that this test should not be undertaken and refer to relevant NICE guidelines</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-32</td>
<td>ENA RNP, Sm, Ro, La, Scl, Jo1 and centromere</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-33</td>
<td>GABA receptor antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-34</td>
<td>GAD65 antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-35</td>
<td>Ganglioside GD1b antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>I-36</td>
<td>Ganglioside GM1 antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-37</td>
<td>Ganglioside GQ1b antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-38</td>
<td>GBM antibody</td>
<td>Every three to six months while on treatment or more frequent if receiving plasma exchange therapy</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-39</td>
<td>Glycine receptor antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-40</td>
<td>Hib antibody</td>
<td>Repeat testing to assess response to test immunisation. Serial monitoring of limited value</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-41</td>
<td>Histone antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-42</td>
<td>IA2 antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-43</td>
<td>IgA low level</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-44</td>
<td>IgE</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-45</td>
<td>IgG low level</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-46</td>
<td>IgG subclasses (1, 2, 3, 4)</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-48</td>
<td>Insulin antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-50</td>
<td>Islet cell antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-51</td>
<td>Liver antibody line blot, including M2-PDH</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>I-52</td>
<td>Liver autoantibodies</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-53</td>
<td>Lymphocyte phenotype CD3, 4, 8, 19, 56</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-54</td>
<td>Leucocyte adhesion molecules</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-55</td>
<td>Lymphocyte phenotyping extended panel</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-56</td>
<td>Mast cell tryptase</td>
<td>Three samples over a 24-hour period for assessment of anaphylaxis (Resuscitation Council UK guidelines advise that samples should be taken at as close to time 0 as possible, and 2 hours after onset with a baseline sample greater than 24 hours.) Repeat testing may be required in mastocytosis. Frequency to be determined by clinical context</td>
<td>NICE. CG134, 2011.104 [Level of evidence – D.]</td>
</tr>
<tr>
<td>I-58</td>
<td>Muscle-specific kinase antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-59</td>
<td>MAG antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-60</td>
<td>MOG antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-61</td>
<td>Myositis antibody profile</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
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</tr>
<tr>
<td>I-63</td>
<td>Neutrophil oxidative burst</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-64</td>
<td>NMDA receptor antibody CSF</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-65</td>
<td>NMDA receptor antibody serum</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-66</td>
<td>Ovarian antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-67</td>
<td>Paraneoplastic antibody profile</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-68</td>
<td>Paraprotein (monolonal band) quantitation</td>
<td>Three months</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-69</td>
<td>Parathyroid antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-70</td>
<td>Parietal cell antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-71</td>
<td>Pemphigoid antibody</td>
<td>On treatment: six months Off treatment: annually</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-72</td>
<td>Pemphigus antibody</td>
<td>On treatment: six months Off treatment: annually</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-73</td>
<td>Phospholipase A2 receptor antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-74</td>
<td>Pituitary antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>I-78</td>
<td>Quantiferon TB IFN gamma</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-79</td>
<td>Rheumatoid factor</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-80</td>
<td>Scleroderma antibody profile</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-81</td>
<td>Serotype-specific anti-pneumococcal antibody (APA)</td>
<td>Repeat testing to assess response to test immunisation. Serial monitoring of limited value</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-82</td>
<td>Serum amyloid A</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-83</td>
<td>Serum free light chains</td>
<td>If available, local guidance and treatment regimens should be followed when requesting paraprotein concentrations for patients on active treatment If no local advice or treatment regimens are available, then the MRI is three months. This is only for diagnosis/monitoring of amyloidosis, non-secretory myeloma and light chain only myeloma</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-84</td>
<td>Serum immunofixation</td>
<td>Not routinely required unless there is a change in serum electrophoresis Not performed as follow up to electrophoresis unless for remission confirmation</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-85</td>
<td>Skeletal (striated) muscle antibody</td>
<td>Not routinely required Comment on ordering that imaging is superior for thymoma investigation</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-86</td>
<td>Specific IgE</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-87</td>
<td>Submaxillary gland antibody</td>
<td>Never</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Test</td>
<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>I-88</td>
<td>Tetanus antibody</td>
<td>Repeat testing to assess response to test immunisation. Serial monitoring of limited value</td>
<td>Consensus of surveyed labs [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-89</td>
<td>tIgE</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>Consensus of surveyed labs [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-90</td>
<td>Thyroid peroxidase antibody</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-91</td>
<td>T-lymphocyte subset CD3, 4, 8</td>
<td>Discuss with lab</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-92</td>
<td>tTG IgA antibody</td>
<td>IgA tTG can be used to monitor response to a gluten-free diet Retesting at six to twelve months depending on pre-treatment value</td>
<td>Wolters Kluwer, 2019.49 [Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-93</td>
<td>tTG IgG antibody</td>
<td>Retesting at six to twelve months Only in IgA-deficient patients</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-94</td>
<td>Urine electrophoresis</td>
<td>Not routinely required</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-95</td>
<td>Urine Free Light Chain Quant</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-96</td>
<td>VGCC antibody</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-97</td>
<td>VGKC antibody CSF</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>I-98</td>
<td>VGKC antibody serum</td>
<td>Repeat testing of limited value. Frequency to be determined by clinical context</td>
<td>[Level of evidence – GPP.]</td>
</tr>
</tbody>
</table>
## Microbiology recommendations

### 5.1 General microbiology

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-1</td>
<td>AFB microscopy and culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-2</td>
<td>Antrum washings</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-3</td>
<td>ASO titre</td>
<td>14 days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-4</td>
<td>Aspirates and fluids from sterile sites</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-5</td>
<td>Blood culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-6</td>
<td><em>Borrelia burgdorferi</em> (Lyme)</td>
<td>14 days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-7</td>
<td>CSF</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-8</td>
<td>Chlamydia NAAT</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-9</td>
<td>GC NAAT</td>
<td>14 days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-10</td>
<td>CFT</td>
<td>14 days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-11</td>
<td>Cough swab</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-12</td>
<td>CSF for molecular investigation, e.g. <em>Meningococcus</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-13</td>
<td>CSF microscopy and culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-14</td>
<td>Drug monitoring: glycopeptides (vancomycin, teicoplanin, etc.)</td>
<td>24 hours</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-15</td>
<td>Drug monitoring: aminoglycoside (gentamicin, amikacin, etc.)</td>
<td>24 hours</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-16</td>
<td>Ear swab</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-17</td>
<td>Ear/nose and throat swab</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>Ref</td>
<td>Clinical situation</td>
<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>M-18</td>
<td>Endocervical swab</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>M-19</td>
<td>Eye swab on same eye</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-20</td>
<td>Faeces – <em>Clostridium difficile</em></td>
<td>Repeated testing after a first positive sample during the same diarrhoeal episode is not recommended in an endemic situation. Repeated testing after a first negative sample during the same diarrhoeal episode may be useful in selected cases with ongoing clinical suspicion during an epidemic situation or in cases with high clinical suspicion during endemic situations. Dependent on result: Confirmed positive: 28 days Equivocal*: 24 hours Negative: 24 hours A test of cure is not recommended *GDH positive/toxin negative</td>
<td>Crobach MJT et al. Clin Microbiol Infect 2016;22:S63–S81.106 [Level of evidence – A/B.]</td>
</tr>
<tr>
<td>M-21</td>
<td>Faeces – ova, cysts and parasites</td>
<td>24 hours</td>
<td></td>
</tr>
<tr>
<td>M-22</td>
<td>Faeces – routine</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-23</td>
<td>Genital swab (GC only)</td>
<td>14 days if symptoms remain after treatment (see also M-9)</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-24</td>
<td>Genital swab microscopy and culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-25</td>
<td><em>Helicobacter pylori</em> – negative serology</td>
<td>28 days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-26</td>
<td><em>Helicobacter pylori</em> – positive serology</td>
<td>Never</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-27</td>
<td>High vaginal swab</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-28</td>
<td>IUCD</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-29</td>
<td>IUCD for <em>Actinomyces</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-30</td>
<td>Joint fluids, microscopy and culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ref</td>
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<td>Recommendation</td>
<td>Source</td>
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</tr>
<tr>
<td>M-31</td>
<td>Mouth swab</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-32</td>
<td>MRSA screen</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-33</td>
<td>MRSA post-erradication therapy</td>
<td>48 hours</td>
<td>[Level of evidence – GPP.]</td>
</tr>
</tbody>
</table>
| M-34 | M. pneumoniae only       | 14 days (if CFT antibody tested; if PCR used no repeat)  
When testing for *Mycoplasma* IgM, a second sample should be taken seven to ten days after a negative if the initial sample was taken early in the illness | [Level of evidence – GPP.] |
| M-35 | Nasal swab               | Seven days               | [Level of evidence – GPP.]                                             |
| M-36 | Nasopharyngeal aspirate  | Seven days               | [Level of evidence – GPP.]                                             |
| M-37 | PD fluids, microscopy and culture | N/A                     | N/A                                                                   |
| M-38 | Peritoneal fluid         | N/A                      | N/A                                                                   |
| M-39 | Pernasal swab (for pertussis) | N/A                 | N/A                                                                   |
| M-40 | Pernasal swabs           | Seven days               |                                                                        |
| M-41 | Pleural effusion/chest fluids | N/A                  | N/A                                                                   |
| M-42 | Pleural fluid            | N/A                      | N/A                                                                   |
| M-43 | *Pneumocystis jirovecii* (DIF/PCR) | N/A                   | N/A                                                                   |
| M-44 | Pus swab                 | Three days or once per episode of drainage | [Level of evidence – GPP.]                                             |
| M-45 | Pus/exudate              | N/A                      | N/A                                                                   |
| M-46 | Seminal fluid            | 28 days                  | [Level of evidence – GPP.]                                             |
| M-47 | Skin, nail and hair for mycology | Three months | [Level of evidence – GPP.]                                             |
| M-48 | Sputum (this excludes investigation of TB, see M-56) | Three days                | [Level of evidence – GPP.]                                             |
| M-49 | Syphilis                 | 14 days after a negative result in an at-risk individual  
For treatment response, test rapid plasma regain (RPR) three monthly | [Level of evidence – GPP.] |
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</tr>
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<tbody>
<tr>
<td>M-50</td>
<td>Throat swab</td>
<td>Dependent on result: Positive: seven days Negative: three days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-51</td>
<td>Tissue/bone microscopy and culture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-52</td>
<td>Tissues and biopsies</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-53</td>
<td>Toxoplasma IgG screen negative</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-54</td>
<td>Toxoplasma IgG screen positive</td>
<td>Never</td>
<td></td>
</tr>
<tr>
<td>M-55</td>
<td>Tuberculosis</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-56</td>
<td>Urethral swab</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-57</td>
<td>Urine for tuberculosis</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M-58</td>
<td>Urine, microscopy and culture</td>
<td>Three days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
<tr>
<td>M-59</td>
<td>Wound and ulcer swab</td>
<td>Seven days</td>
<td>[Level of evidence – GPP.]</td>
</tr>
</tbody>
</table>
5.2 **Fungal recommendations**

Recommendations are based on consensus expert peer opinion with supporting references *[Level of evidence – GPP.]*

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• single negative sample can be used to exclude IA</td>
<td>Furfaro E et al. <em>Transpl Infect Dis</em> 2012;14:E38–E39.108</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• two consecutive positive samples provide good positive predictive value</td>
<td>Leeflang MM et al. <em>Cochrane Database Syst Rev</em> 2008;4:CD007394.109</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• reduction of the GM index during the first two weeks of antifungal therapy is a reliable predictor of treatment response</td>
<td>Chai LY et al. <em>J Clin Microbiol</em> 2012;50:2330–2336.110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diagnostic GM on BAL is the most sensitive test</td>
<td>Nuer SA et al. <em>Clin Infect Dis</em> 2011;53:671–676.111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Neutropenic patients and allogeneic stem cell transplantation recipients during the early engraftment phase, who are not on mould-active antifungal prophylaxis or treatment</td>
<td>Bergeron A et al. <em>J Clin Microbiol</em> 2012;50:823–830.112</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schelenz S et al. <em>Lancet Infect Dis</em> 2015;15:461–474.113</td>
</tr>
<tr>
<td>Ref</td>
<td>Clinical situation</td>
<td>Recommendation</td>
<td>Source</td>
</tr>
<tr>
<td>------</td>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| M-61 | BDG                | Twice-weekly screening for severely ill intensive care unit patients and patients with haematological malignancies and post-allogeneic hematopoietic stem cell transplants:  
- single negative sample can be used to exclude diagnosis of most invasive fungal infection (notable exceptions include mucoraceous mould infection, cryptococcosis, some dimorphic fungi and other rare fungi) repeating positive BDG results is not clinically helpful as it may take several weeks to clear from system | Eggimann P et al. Crit Care 2011;15:1017,115  
6 Virology recommendations

If no source is quoted, then the recommendation is based on the response from the RCPath SAC for virology.

Any life-threatening serology result must lead to resampling if this is the first occasion, and the result confirmed for specificity.

6.1 Congenital/perinatal blood-borne viral infection – testing in asymptomatic infants

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-1</td>
<td>Maternal infection with HIV</td>
<td><strong>Non-breastfed infant</strong>&lt;br&gt;Test infant blood (EDTA) for HIV proviral DNA PCR:&lt;br&gt;• during the first 48 hours&lt;br&gt;• at two weeks (if high risk*)&lt;br&gt;• at six weeks (or two weeks after cessation of prophylaxis)&lt;br&gt;• at 12 weeks (or eight weeks after cessation of prophylaxis)&lt;br&gt;On other occasions if additional risk:&lt;br&gt;• test HIV Ag/Ab for seroreversion at 18–24 months</td>
<td>British HIV Association, 2018.¹¹⁹ [Level of evidence – C/D.]</td>
</tr>
</tbody>
</table>

**Breastfed infant**<br>Test infant blood (EDTA) for HIV proviral DNA PCR:<br>• during the first 48 hours<br>• at two weeks<br>• monthly for the duration of breastfeeding<br>• at four and eight weeks after cessation of breastfeeding<br>On other occasions if additional risk:<br>• test HIV Ag/Ab for seroreversion at 18–24 months<br>*High risk denotes a detectable maternal HIV RNA viraemia at 36 weeks and at birth|
<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-2</td>
<td>Maternal infection with hepatitis B</td>
<td>Test infant blood (clotted or dried blood spot) for HBsAg at 12 months of age</td>
<td>Public Health England, 2021.120 [Level of evidence – D.]</td>
</tr>
</tbody>
</table>
| V-3  | Confirmed viraemic HCV infection in pregnancy          | Test infant blood (EDTA) for HCV RNA PCR at two to three months of age. If detected, repeat HCV RNA PCR at six months of age  
|      |                                                        | In addition, test infant blood (clotted or dried blood spot) for anti-HCV at 12–18 months  
|      |                                                        | There is no further follow up if anti-HCV negative and the HCV RNA PCR at two to three months was also negative  
|      |                                                        | If anti-HCV is positive, perform a further HCV RNA PCR and refer to the PHE algorithm | Public Health England, 2018.121 [Level of evidence – A.]                 |
### 6.2 Renal testing

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-4</td>
<td>Renal failure – BBV status of patients starting HD in the UK</td>
<td>Test HIV Ag/Ab, Anti-HCV and HBsAg pre-dialysis Include HCV RNA PCR if current risk factors for HCV acquisition Anti-HBV should be checked prior to immunisation, especially in patients with risk factors for previous HBV exposure</td>
<td>The Renal Association, 2019[^122] [Level of evidence – A.]</td>
</tr>
<tr>
<td>V-5</td>
<td>Ongoing surveillance for HIV in the prevalent HD population</td>
<td>Test HIV Ag/Ab three-monthly (if risk factors)</td>
<td>The Renal Association, 2019[^122] [Level of evidence – C.]</td>
</tr>
<tr>
<td>V-6</td>
<td>Ongoing surveillance for HCV in the prevalent HD population</td>
<td>Test anti-HCV three-monthly (include HCV RNA PCR if there are current risk factors for HCV acquisition)</td>
<td>The Renal Association, 2019[^122] [Level of evidence – C.]</td>
</tr>
<tr>
<td>V-7</td>
<td>Ongoing surveillance for HBV in the prevalent HD population</td>
<td>Test HBsAg three-monthly (if anti-HBs &gt;100 IU/mL, then can consider testing six monthly)</td>
<td>The Renal Association, 2019[^122] [Level of evidence – C.]</td>
</tr>
<tr>
<td>V-8</td>
<td>Renal failure – enhanced surveillance for those at intermediate/high risk for new BBV following dialysis abroad (all BBV testing) or if a new BBV infection is identified in the HD unit (only for the specific BBV infection) For HCV</td>
<td>Test HCV RNA PCR or HCV antigen or HCV antigen/antibody every two weeks for three months</td>
<td>Department of Health, 2002[^123] The Renal Association, 2019[^122] [Level of evidence – B.]</td>
</tr>
<tr>
<td>V-9</td>
<td>Renal failure – enhanced surveillance for those at intermediate/high risk for new BBV following dialysis abroad (all BBV testing) or if a new BBV infection is identified in the HD unit (only for the specific BBV infection) For HBV</td>
<td>Test HBsAg or HBV PCR every two weeks for three months (independent of anti-HBs level)</td>
<td>The Renal Association, 2019[^122] [Level of evidence – B.]</td>
</tr>
</tbody>
</table>

[^122]: Reference number for further details.
<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-10</td>
<td>Renal failure – enhanced surveillance for those at intermediate/high risk for new BBV following dialysis abroad (all BBV testing) or if a new BBV infection is identified in the HD unit (only for the specific BBV infection) For HIV</td>
<td>Test HIV Ag/Ab or HIV RNA PCR every two weeks for three months (only if risk following dialysis away from base)</td>
<td>The Renal Association, 2019.\textsuperscript{122} [Level of evidence – B.]</td>
</tr>
</tbody>
</table>
### 6.3 Post-exposure to blood-borne viruses

<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
</table>
| V-11 | Potential significant exposure to HBsAg positive material, hepatitis B susceptible | Assess risk and recipient HBV immunity  
Collect baseline blood for storage from recipient  
Intervene with HBV vaccine ± HBIG as appropriate to scenario  
Test HBsAg at three months  
Test HBsAg, anti-HBc at six months  
Test anti-HBs one to two months after vaccine course | [Level of evidence – GPP.] |
| V-12 | Potential significant exposure to HIV positive material but no post-exposure prophylaxis given  
(Note: if the recipient is taking PREP then be aware that this can alter the HIV Ag/Ab responses and the case should be discussed with a consultant virologist) | Collect baseline blood for storage  
If exposed to Occupational Health (OH), the guidance states that minimum testing should be an HIV Ag/Ab test 12 weeks after exposure. However, earlier testing can also occur in addition to this if required (at four weeks post-exposure)  
In a non-occupational health setting, the BASHH guidance should be followed stating that a negative HIV Ag/Ab test on a fourth-generation assay performed at 4 weeks post-exposure is likely to exclude HIV infection. A further test at eight weeks post-exposure need only be considered following an event assessed as carrying a high risk of infection | Department of Health and Social Care, 2008.  
[Level of evidence – D.]  
BASHH guidelines, 2019.  
[Level of evidence – D.] |
<table>
<thead>
<tr>
<th>Ref</th>
<th>Clinical situation</th>
<th>Recommendation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The DOH OH guidance states that minimum testing should be an HIV Ag/Ab test 12 weeks after cessation of PEP. In addition, an earlier test can be performed as well (at four to six weeks post-cessation PEP)</td>
<td></td>
</tr>
<tr>
<td>V-14</td>
<td>Potential significant exposure to HCV-positive material</td>
<td>Test at six weeks by HCV RNA PCR and by both HCV RNA PCR and anti-HCV at 12 weeks If negative, test at 24 weeks with anti-HCV alone</td>
<td>Ramsay ME. Commun Dis Public Health 1999;2:258–262.126 [Level of evidence – D.]</td>
</tr>
</tbody>
</table>
7 Cellular pathology recommendations

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

[Level of evidence – GPP.]

Please note that the letters in parenthesis in the sections below refer to the recommendation number.

7.1 General aspects of laboratory practice

a) It is not helpful to specify MRI 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) When a diagnosis has been confidently established on preoperative biopsies, it is 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/profession/guidelines/cancer-datasets-and-tissue-pathways.html) (CP-2).

c) No specific implications or roles have been identified for MRI in neuropathology or non-forensic autopsy (CP-3).

7.2 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).

7.3 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 a 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 or 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) Re-biopsy 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 hepatitis C) or if the initial sample is insufficient for diagnosis (CP-12).

8 Criteria for audit

- There should be a full consultation with all users prior to any implementation of a MRI standard: 100%.
- There should be an education package supporting the introduction of a MRI standard: 100%.
- The number of requests ordered earlier than the defined MRI out the total workload of that test standard: no more than 5%.
- The number of requests ordered earlier than the defined MRI in which the MRI is overruled and a reason is recorded by the requestor standard: 100%.

9 Contributors

Many people were involved in the preparation and/or review of recommendations for MRI 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.

The following individuals, groups and societies contributed directly or supported/endorsed the content:

- Ms Maria Marrero Feo, RCPath Clinical Effectiveness team
- Prof Mario Plebani, University-Hospital of Padova, Padova, Italy
- Members of the ACB Clinical Practice Section
- Members of the RCPath SAC for Cellular Pathology
- Members of the RCPath SAC for Immunology
- Members of the RCPath SAC for Virology
- Members of the RCPath SAC for Clinical Biochemistry
- Members of the RCPath SAC for Microbiology
- Members of the Intercollegiate Committee on Haematology
- Members of the Lab Tests Online Board
- Members of the National Demand Optimisation Group
- Members of the RCPath Lay Governance Group
10 References


25. Association for Clinical Biochemistry, British Thyroid Association and British Thyroid Foundation. UK Guidelines for the Use of Thyroid Function Tests. London, UK: Association for Clinical Biochemistry, British Thyroid Association, 2006.


29. NICE. Guideline NG23 Menopause: Diagnosis and Management. Available at: www.nice.org.uk/guidance/ng23


34. NICE. Type 2 Diabetes. London: NICE, 2015. Available at: www.nice.org.uk/guidance/ng28


48. NICE. Chronic Heart Failure in Adults: Diagnosis and Management. London, UK: NICE, 2018. Available at: www.nice.org.uk/guidance/ng106


57. GAIN. Investigation and Management of the Adult Patient with Anaemia Microcytic Anaemia. Available at: www.rqia.org.uk/RQIA/files/1e/1e2a9adc-7517-4a47-858a-5192b0746456.pdf


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87. NICE. *Type 1 Diabetes: Diagnosis and Management of Type 1 Diabetes in Children and Young People*. London, UK: NICE, 2004.


### Appendix A  Summary table – explanation of grades of evidence
(modified from Palmer K et al. BMJ 2008;337:1832)

<table>
<thead>
<tr>
<th>Grade (level) of evidence</th>
<th>Nature of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade A</strong></td>
<td>At least one high-quality meta-analysis, systematic review of randomised controlled trials or a randomised controlled trial with a very low risk of bias and directly attributable to the target population or A body of evidence demonstrating consistency of results and comprising mainly well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias, directly applicable to the target population.</td>
</tr>
<tr>
<td><strong>Grade B</strong></td>
<td>A body of evidence demonstrating consistency of results and comprising mainly high-quality systematic reviews of case-control or cohort studies and high-quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relation is causal and which are directly applicable to the target population or Extrapolation evidence from studies described in A.</td>
</tr>
<tr>
<td><strong>Grade C</strong></td>
<td>A body of evidence demonstrating consistency of results and including well-conducted case-control or cohort studies and high-quality case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relation is causal and which are directly applicable to the target population or Extrapolation evidence from studies described in B.</td>
</tr>
<tr>
<td><strong>Grade D</strong></td>
<td>Non-analytic studies such as case reports, case series or expert opinion or Extrapolation evidence from studies described in C.</td>
</tr>
<tr>
<td><strong>Good practice point (GPP)</strong></td>
<td>Recommended best practice based on the clinical experience of the authors of the writing group.</td>
</tr>
</tbody>
</table>
Appendix B  AGREE II guideline monitoring sheet

The guidelines of the Royal College of Pathologists comply with the AGREE II standards for good quality clinical guidelines. The sections of this guideline that indicate compliance with each of the AGREE II standards are indicated in the table.

<table>
<thead>
<tr>
<th>AGREE standard</th>
<th>Section of guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope and purpose</strong></td>
<td></td>
</tr>
<tr>
<td>1 The overall objective(s) of the guideline is (are) specifically described</td>
<td>Introduction</td>
</tr>
<tr>
<td>2 The health question(s) covered by the guideline is (are) specifically described</td>
<td>Introduction</td>
</tr>
<tr>
<td>3 The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described</td>
<td>Foreword</td>
</tr>
<tr>
<td><strong>Stakeholder involvement</strong></td>
<td></td>
</tr>
<tr>
<td>4 The guideline development group includes individuals from all the relevant professional groups</td>
<td>Foreword</td>
</tr>
<tr>
<td>5 The views and preferences of the target population (patients, public, etc.) have been sought</td>
<td>Foreword</td>
</tr>
<tr>
<td>6 The target users of the guideline are clearly defined</td>
<td>Introduction</td>
</tr>
<tr>
<td><strong>Rigour of development</strong></td>
<td></td>
</tr>
<tr>
<td>7 Systematic methods were used to search for evidence</td>
<td>Foreword</td>
</tr>
<tr>
<td>8 The criteria for selecting the evidence are clearly described</td>
<td>Foreword</td>
</tr>
<tr>
<td>9 The strengths and limitations of the body of evidence are clearly described</td>
<td>Foreword</td>
</tr>
<tr>
<td>10 The methods for formulating the recommendations are clearly described</td>
<td>Foreword</td>
</tr>
<tr>
<td>11 The health benefits, side effects and risks have been considered in formulating the recommendations</td>
<td>Foreword and Introduction</td>
</tr>
<tr>
<td>12 There is an explicit link between the recommendations and the supporting evidence</td>
<td>2–7</td>
</tr>
<tr>
<td>13 The guideline has been externally reviewed by experts prior to its publication</td>
<td>Foreword</td>
</tr>
<tr>
<td>14 A procedure for updating the guideline is provided</td>
<td>Foreword</td>
</tr>
<tr>
<td><strong>Clarity of presentation</strong></td>
<td></td>
</tr>
<tr>
<td>15 The recommendations are specific and unambiguous</td>
<td>2–7</td>
</tr>
<tr>
<td>16 The different options for management of the condition or health issue are clearly presented</td>
<td>2–7</td>
</tr>
<tr>
<td>17 Key recommendations are easily identifiable</td>
<td>2–7</td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
<td></td>
</tr>
<tr>
<td>18 The guideline describes facilitators and barriers to its application</td>
<td>Foreword</td>
</tr>
<tr>
<td>19 The guideline provides advice and/or tools on how the recommendations can be put into practice</td>
<td>1–7</td>
</tr>
<tr>
<td>20 The potential resource implications of applying the recommendations have been considered</td>
<td>Foreword</td>
</tr>
<tr>
<td>21 The guideline presents monitoring and/or auditing criteria</td>
<td>8</td>
</tr>
<tr>
<td><strong>Editorial independence</strong></td>
<td></td>
</tr>
<tr>
<td>22 The views of the funding body have not influenced the content of the guideline</td>
<td>Foreword</td>
</tr>
<tr>
<td>23 Competing interest of guideline development group members have been recorded and addressed</td>
<td>Foreword</td>
</tr>
</tbody>
</table>