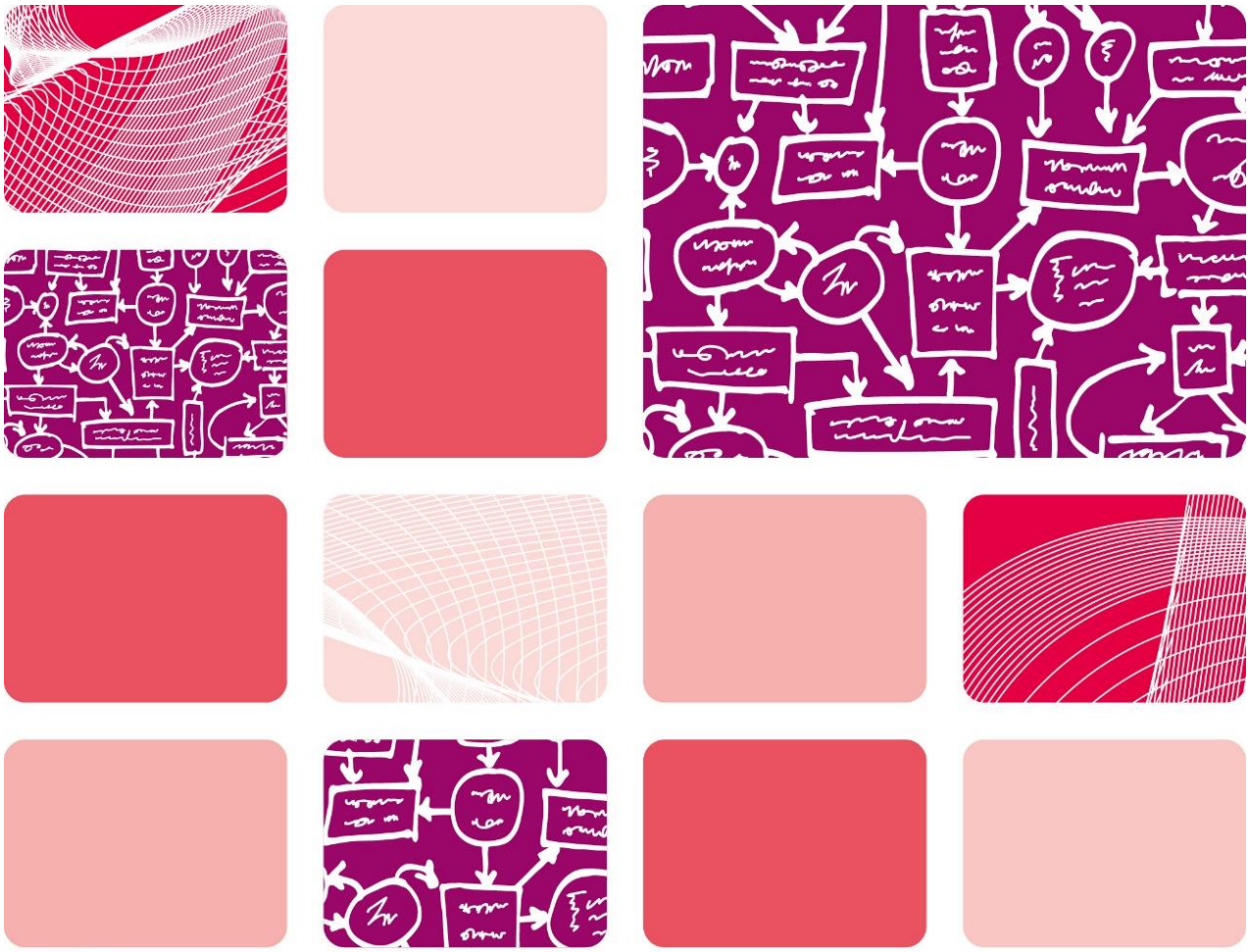
UK Health Security Agency

UK Standards for Microbiology Investigations

Pneumonia



Issued by the Standards Unit, UK Standards for Microbiology Investigations, UKHSA

Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of UKHSA working in partnership with the partner organisations whose logos are displayed below and listed on the UK SMI website. UK SMIs are developed, reviewed and revised by various working groups which are overseen by a steering committee.

The contributions of many individuals in clinical, specialist and reference laboratories who have provided information and comments during the development of this document are acknowledged. We are grateful to the medical editors for editing the medical content.

UK SMIs are produced in association with:

Displayed logos correct as of December 2024

Contents

Amendment table

Each UK SMI document has an individual record of amendments. The amendments are listed on this page. The amendment history is available from standards@ukhsa.gov.uk.

Any alterations to this document should be controlled in accordance with the local document control process.

Amendment number/date	3/24.04.25
Issue number discarded	1.2
Insert issue number	1.3
Section(s) involved	**Amendment**
Whole document.	**This is an administrative point change.** **The content of this UK SMI document has not changed.** **The last scientific and clinical review was conducted on 24.12.2012.** Hyperlinks throughout document updated to Royal College of Pathologists website. Public Health England replaced with UK Health Security Agency throughout the document, including the updated Royal Coat of Arms Partner organisation logos updated. Broken links to devolved administrations replaced. References to NICE accreditation removed. Scope and Purpose replaced with General and Scientific information to align with current UK SMI template.
Section 10: Public health responsibilities of diagnostic laboratories	This section has been added to UK SMI templates to highlight the public health responsibilities that diagnostic laboratories have as part of their duties.

Amendment No/Date.	2/17.03.14
Issue no. discarded.	1.1
Insert Issue no.	1.2
Section(s) involved	**Amendment**

Whole document.	Document has been transferred to a new template to reflect the Health Protection Agency's transition to Public Health England. Front page has been redesigned. Status page has been renamed as Scope and Purpose and updated as appropriate. Professional body logos have been reviewed and updated. Standard safety and notification references have been reviewed and updated. Scientific content remains unchanged.

Amendment No/Date.	1/24.12.12
Issue no. discarded.	1
Insert Issue no.	1.1
Section(s) involved	**Amendment**
References.	Hyperlink removed.

1 General information

View general information related to UK SMIs.

2 Scientific information

View scientific information related to UK SMIs.

3 Scope of Document

UK Standards for Microbiology Investigations (SMIs) comprise a collection of recommended algorithms for initial test selection and testing methods and confirmatory strategies. UK SMIs also contain guidance notes that describe the recommended standard set of investigations consistent with current good practice in different infective disease presentations, as well as examples of standard laboratory practice and general information on clinical syndromes.

The syndromic algorithms form part of the pre-analytical stage of the investigative process and are intended to guide clinicians and diagnostic laboratory staff in the choice of the correct pathway for the investigation of a sample based upon the clinical context. It is recognised that clinical details are essential to the optimal processing of samples and the documents perform best when sufficient, relevant, clinical details are provided at the time of sample submission. The algorithms are presented in flowchart format to give a clear overview of how to proceed with the testing of specimens and the possible outcomes using the clinical history provided. If the primary testing set does not identify a causative pathogen, secondary testing should be performed if clinical and/or epidemiological features support such testing. Laboratories may wish to undertake second line tests either after, or at the same time as, the primary testing set according to the clinical and local epidemiological setting and laboratory operational capabilities. The flowcharts are intended to reflect current recommended practice, accounting for prevalence of infections in the UK, public health needs, and availability of tests, with references and links to more detailed guidance. National surveillance programmes for specific organisms should be taken into consideration when using the algorithms.

This document should be read in conjunction with relevant SMIs for laboratory processing and reporting of target organisms and public health actions.

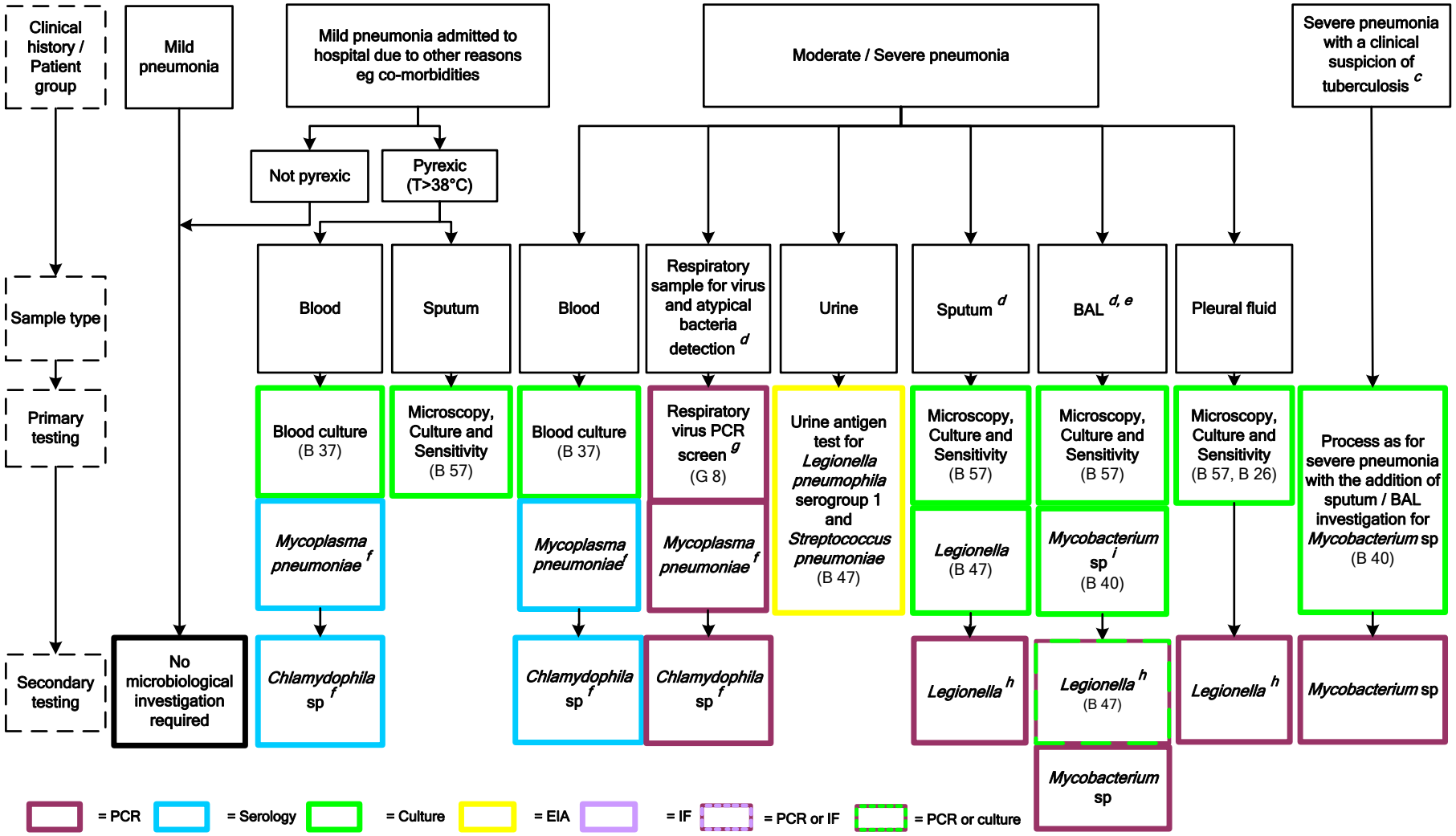
3.1 Scope

The term “Lower Respiratory Tract Infection” (LRTI) often encompasses a broad range of respiratory conditions such as pneumonia, bronchitis / bronchiolitis, exacerbations of chronic obstructive pulmonary disease / asthma[1]. This syndromic algorithm is intended to deal specifically with pneumonia. Pneumonia is defined as the presence of clinical signs and symptoms of LRTI, along with radiological changes that are consistent with pneumonia. An assessment of illness severity should be made clinically, supported by reference to CURB-65[a] scoring (in patients under 30 years of age, the CURB-65 score may be a less reliable indication of severity). On this basis, this algorithm deals with the investigation of patients presenting with pneumonia that is judged to be either clinically mild or severe. Pneumonia that may be judged to be

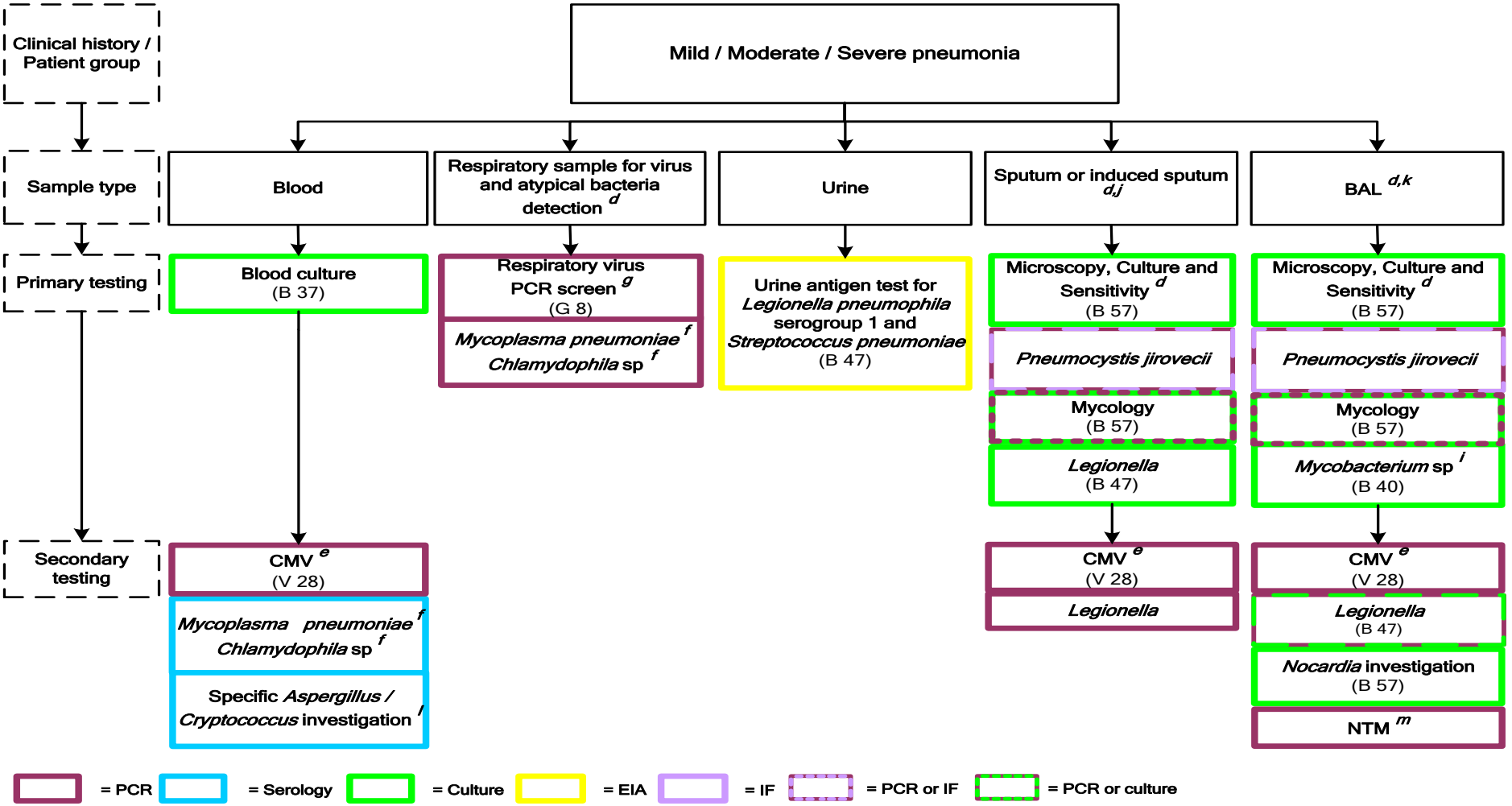
moderate can still reflect a significant risk of mortality and therefore, should be investigated as for severe pneumonia. The collection of diagnostic samples (respiratory, urine and blood) should be carried out before the administration of antimicrobials in order to increase the likelihood of a microbiological diagnosis but initiation of treatment should not be delayed in severe cases. If this is not possible, then samples taken for bacterial diagnosis should be collected at a maximum of 24 hours from the start of antimicrobial therapy whenever possible.

In patients who are immunocompromised, microbiological investigation should be carried out to the same extent if they are judged to have mild or severe pneumonia. This is due to the fact that the presentation of pneumonia in this patient group can be atypical and the CURB-65[a] scoring system has not been validated for them. In addition, progression from mild to severe illness can be rapid.

4 Pneumonia in Immunocompetent Adults[1-8, b]



5 Pneumonia in Immunocompromised Adults[1-8, b]



Footnotes

a) CURB-65, also known as CURB, criteria is a clinical prediction rule that has been validated for predicting mortality in community acquired pneumonia. It is recommended by the British Thoracic Society[1].

b) The microbiological investigation of pneumonia outlined in this algorithm is based on the assumption that the results of such investigations will be acted on in a timely manner. A positive microbiological diagnosis should lead to a narrowing down of the spectrum of antimicrobial treatment from the initial empirical therapy, in the interests of reducing adverse effects of broad-spectrum antimicrobial treatment, and contributing to antimicrobial stewardship.

c) Gram or Giemsa staining of sputum and BAL samples in addition to examination by microscopy is only appropriate where sufficient laboratory expertise and a validated methodology exist.

d) Respiratory samples for viral PCR screening are ideally lower respiratory tract samples such as an induced sputum, BAL or endo-tracheal aspirate. Where this is not possible, a nose/throat swab is acceptable. The preferred samples for PCR of *M. pneumoniae* and *Chlamydophila* species are lower respiratory tract samples or throat swab.

e) Literature on the interpretation of HSV and CMV by PCR testing is not clear for sputum specimens. PCR should be performed on sputum according to clinical discretion, for example, when BAL samples are not available.

f) The serological investigation of *M. pneumoniae* is increasingly being replaced by PCR detection in respiratory samples. Serological diagnosis of *M. pneumoniae* is valuable, but may not provide a definitive result until the convalescent phase of the illness. Serological diagnosis may be unreliable in patients who are immunocompromised. Serology can be useful in some circumstances but PCR is being increasingly used for both *Chlamydophila pneumoniae* and *Chlamydophila psittaci.* For the purpose of this algorithm *Chlamydophila* species include *Chlamydophila pneumoniae* and *Chlamydophila psittaci*.

g) Viral PCR screen is the same for patients who are immunocompetent and immunocompromised. The minimum targets for viral PCR screen should be based on local assessments, and may include: Influenza A, Influenza B, RSV, Adenovirus and Parainfluenza viruses.

h) Legionella PCR can detect *Legionella pneumophila* non-serotype 1 and other *Legionella* species.

i) Investigations for *Mycobacterium* species should be carried out where there is a clinical suspicion of tuberculosis, such as upper lobar cavitation on chest X-ray.

j) Immunocompromised patients may present with only mild clinical symptoms, and therefore may not be able to produce a sputum sample without either physiotherapy or other methods such as aerosolised saline inhalation. Therefore, it may be understandably difficult to obtain a sample before the administration of antimicrobials.

k) The possible adverse effects of bronchoalveolar lavage, such as the risk of requiring subsequent ventilation, should be taken into account when considering performing the procedure on a sick patient who is not already on ventilation. Where a BAL is performed, it should be preferably ‘directed’, but if this is not available, then a ‘blind’ BAL is acceptable.

l) Consider the testing of serum for *Cryptococcus* antigen and *Aspergillus* antigen (galactomannan).

m) Non-tuberculous mycobacteria (NTM), also known as environmental mycobacteria, atypical mycobacteria and mycobacteria other than tuberculosis (MOTT), are mycobacteria which do not cause tuberculosis but have been recognised as causing human disease in patients who are immunocompromised and PCR for these organisms should be considered as a secondary test.

Additional footnotes for information and not stated in the flowcharts:

n) Consider other uncommon pathogens that may be responsible for infection, for example *Coxiella burnetii*. Travel history is relevant to considering exotic fungal pathogens, eg, *Histoplasma* sp, *Coccidioides* sp, and meliodosis, while even a distant travel history may be relevant in *Strongyloides stercoralis* in the immunocompromised.

o) A lung biopsy, if taken, should be sent for both microbiology and histopathology investigation.

p) Some patients who present with features of LRTI may have non-infective causes, such as vasculitis or cancer.

q) It should be remembered that patients not known to be immunocompromised, eg, an undiagnosed HIV infection, and without recognised risk factors can present with pneumocystis pneumonia.

r) Patients with mild pneumonia can require testing in influenza season for influenza A and B, particularly if co-morbidities are present which may be valuable in local clinical settings.

6 Notification to UKHSA [9,10] or Equivalent in the Devolved Administrations[11-14]

The Health Protection (Notification) regulations 2010 require diagnostic laboratories to notify Public Health England (UKHSA) when they identify the causative agents that are listed in Schedule 2 of the Regulations. Notifications must be provided in writing, on paper or electronically, within seven days. Urgent cases should be notified orally and as soon as possible, recommended within 24 hours. These should be followed up by written notification within seven days.

For the purposes of the Notification Regulations, the recipient of laboratory notifications is the local UKHSA Health Protection Team. If a case has already been notified by a registered medical practitioner, the diagnostic laboratory is still required to notify the case if they identify any evidence of an infection caused by a notifiable causative agent.

Notification under the Health Protection (Notification) Regulations 2010 does not replace voluntary reporting to UKHSA. The vast majority of NHS laboratories voluntarily report a wide range of laboratory diagnoses of causative agents to UKHSA and many UKHSA Health protection Teams have agreements with local laboratories for urgent reporting of some infections. This should continue.

Note: The Health Protection Legislation Guidance (2010) includes reporting of Human Immunodeficiency Virus (HIV) & Sexually Transmitted Infections (STIs), Healthcare Associated Infections (HCAIs) and Creutzfeldt–Jakob disease (CJD) under ‘Notification Duties of Registered Medical Practitioners’: it is not noted under ‘Notification Duties of Diagnostic Laboratories’.

Other arrangements exist in Scotland[11,12], Wales[13] and Northern Ireland[14].

7 Public health responsibilities of diagnostic laboratories

Diagnostic laboratories have public health responsibility as part of their duties. Amongst these are additional local testing, or referral to further characterise the organism as required, primarily for public health purposes e.g. routine cryptosporidium detection; serotyping or microbial subtyping; and a duty to refer appropriate specimens and isolates of public health importance to a reference laboratory.

Diagnostic laboratory outputs inform public health intervention, and surveillance data is required to develop policy and guidance forming an essential component of healthcare. It is recognised that additional testing and referral of samples may entail some costs that has to be borne by the laboratory but in certain jurisdictions these costs are covered centrally.

Diagnostic laboratories should be mindful of the impact of laboratory investigations on public health and consider requests from the reference laboratories for specimen referral or enhanced information.

References

An explanation of the reference assessment used is available in the scientific information section on the UK SMI website.

1. The British Thoracic Society. Guidelines for the Management of Community Acquired Pneumonia in Adults. 23-1-2009.

2. American Thoracic Society. Guidelines for the Management of Adults with Hospital-Acquired, Ventilator-Associated, and Healthcare-Associated Pneumonia. Am J Respir Crit Care Med 2005;171:388-416.

3. Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis 2007;44 Suppl 2:S27-S72.

4. Masterton RG, Galloway A, French G, Street M, Armstrong J, Brown E, et al. Guidelines for the management of hospital-acquired pneumonia in the UK: report of the working party on hospital-acquired pneumonia of the British Society for Antimicrobial Chemotherapy. J Antimicrob Chemother 2008;62:5-34.

5. Torres A, Ewig S, Lode H, Carlet J. Defining, treating and preventing hospital acquired pneumonia: European perspective. Intensive Care Med 2009;35:9-29.

6. Torres A, Ewig S, Lode H, Carlet J. Hospital-acquired pneumonia in Europe. Eur Respir J 2009;33:951-2.

7. Woodhead M, Blasi F, Ewig S, Huchon G, Leven M, Ortqvist A, et al. Guidelines for the management of adult lower respiratory tract infections. Eur Respir J 2005;26:1138-80.

8. Scottish Intercollegiate Guidelines Network. Community Management of Lower Respiratory Tract Infection in Adults. 2009.

9. Public Health England. Laboratory Reporting to Public Health England: A Guide for Diagnostic Laboratories. 2013. p. 1-37.

10. Department of Health. Health Protection Legislation (England) Guidance. 2010. p. 1-112.

11. Scottish Government. Public Health (Scotland) Act. 2008 (as amended).

12. Scottish Government. Public Health etc. (Scotland) Act 2008. Implementation of Part 2: Notifiable Diseases, Organisms and Health Risk States. 2009.

13. The Welsh Assembly Government. Health Protection Legislation (Wales) Guidance. 2010.

14. Home Office. Public Health Act (Northern Ireland) 1967 Chapter 36. 1967 (as amended).