NICE National Institute for Health and Care Excellence

Pneumonia

Diagnosis and management of community- and hospital-acquired pneumonia in adults

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NICE clinical guideline 191

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Contents

Introduction

Pneumonia is an infection of the lung tissue. When a person has pneumonia the air sacs in their lungs become filled with microorganisms, fluid and inflammatory cells and their lungs are not able to work properly. Diagnosis of pneumonia is based on symptoms and signs of an acute lower respiratory tract infection, and can be confirmed by a chest X-ray showing new shadowing that is not due to any other cause (such as pulmonary oedema or infarction). In this guideline pneumonia is classified as community-acquired or hospital-acquired, based on different microbial causes and patient factors, which need different management strategies.

Every year between 0.5% and 1% of adults in the UK will have community-acquired pneumonia. It is diagnosed in 5–12% of adults who present to GPs with symptoms of lower respiratory tract infection, and 22–42% of these are admitted to hospital, where the mortality rate is between 5% and 14%. Between 1.2% and 10% of adults admitted to hospital with community-acquired pneumonia are managed in an intensive care unit, and for these patients the risk of dying is more than 30%. More than half of pneumonia-related deaths occur in people older than 84 years.

At any time 1.5% of hospital inpatients in England have a hospital-acquired respiratory infection, more than half of which are hospital-acquired pneumonia and are not associated with intubation. Hospital-acquired pneumonia is estimated to increase hospital stay by about 8 days and has a reported mortality rate that ranges from 30–70%. Variations in clinical management and outcome occur across the UK.

The guideline is needed because pneumonia is common and has a high mortality rate. The British Thoracic Society (2009) has published guidance on the management of community-acquired pneumonia in adults, but there is a lack of evidence-based guidance on the management of hospital-acquired pneumonia. For both types of pneumonia there is variation in care and areas of uncertainty for best practice, and these are the main focus of this guideline.

This guideline provides recommendations for the management of suspected and confirmed community- and hospital-acquired pneumonia in adults. However, it does not provide recommendations on areas of care where best practice is already established, such as diagnosis using chest X-ray. This guideline does not cover bronchiectasis complicated by pneumonia, people younger than 18 years, or patients who acquire pneumonia while intubated or in an intensive care unit, who are immunocompromised, or in whom management of pneumonia is an expected part of end-of-life care.

Medicines recommendations

The guideline will assume that prescribers will use a medicine's summary of product characteristics to inform decisions made with individual patients.

Patient-centred care

This guideline offers best practice advice on the care of adults with community-acquired pneumonia and hospital-acquired pneumonia.

Patients and healthcare professionals have rights and responsibilities as set out in the NHS Constitution for England – all NICE guidance is written to reflect these. Treatment and care should take into account individual needs and preferences. Patients should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. Healthcare professionals should follow the Department of Health's advice on consent. If someone does not have capacity to make decisions, healthcare professionals should follow the code of practice that accompanies the Mental Capacity Act and the supplementary code of practice on deprivation of liberty safeguards.

NICE has produced guidance on the components of good patient experience in adult NHS services. All healthcare professionals should follow the recommendations in patient experience in adult NHS services.

Key priorities for implementation

The following recommendations have been identified as priorities for implementation. The full list of recommendations is in section 1.

Presentation with lower respiratory tract infection

- For people presenting with symptoms of lower respiratory tract infection in primary care, consider a point of care C-reactive protein test if after clinical assessment a diagnosis of pneumonia has not been made and it is not clear whether antibiotics should be prescribed. Use the results of the C-reactive protein test to guide antibiotic prescribing in people without a clinical diagnosis of pneumonia as follows:
  - Do not routinely offer antibiotic therapy if the C-reactive protein concentration is less than 20 mg/litre.
  - Consider a delayed antibiotic prescription (a prescription for use at a later date if symptoms worsen) if the C-reactive protein concentration is between 20 mg/litre and 100 mg/litre.
  - Offer antibiotic therapy if the C-reactive protein concentration is greater than 100 mg/litre.

Community-acquired pneumonia

Microbiological tests

- For patients with moderate- or high-severity community-acquired pneumonia:
  - take blood and sputum cultures **and**
  - consider pneumococcal and legionella urinary antigen tests.

Timely diagnosis and treatment

- Put in place processes to allow diagnosis (including X-rays) and treatment of community-acquired pneumonia within 4 hours of presentation to hospital.

Antibiotic therapy

Low-severity community-acquired pneumonia

- Offer a 5-day course of a single antibiotic to patients with low-severity community-acquired pneumonia.
- Do not routinely offer patients with low-severity community-acquired pneumonia:
  - a fluoroquinolone
  - dual antibiotic therapy.

Patient information

- Explain to patients with community-acquired pneumonia that after starting treatment their symptoms should steadily improve, although the rate of improvement will vary with the severity of the pneumonia, and most people can expect that by:
  - 1 week: fever should have resolved
  - 4 weeks: chest pain and sputum production should have substantially reduced
  - 6 weeks: cough and breathlessness should have substantially reduced
  - 3 months: most symptoms should have resolved but fatigue may still be present
  - 6 months: most people will feel back to normal.

1 Recommendations

The following guidance is based on the best available evidence. The full guideline gives details of the methods and the evidence used to develop the guidance.

The wording used in the recommendations in this guideline (for example, words such as 'offer' and 'consider') denotes the certainty with which the recommendation is made (the strength of the recommendation). See about this guideline for details.

Terms used in this guideline:

Clinical diagnosis of community-acquired pneumonia Diagnosis based on symptoms and signs of lower respiratory tract infection in a patient who, in the opinion of the GP and in the absence of a chest X-ray, is likely to have community-acquired pneumonia. This might be because of the presence of focal chest signs, illness severity or other features.

Community-acquired pneumonia Pneumonia that is acquired outside hospital. Pneumonia that develops in a nursing home resident is included in this definition. When managed in hospital the diagnosis is usually confirmed by chest X-ray.

Dual antibiotic therapy Treatment with 2 different antibiotics at the same time.

Hospital-acquired pneumonia Pneumonia that develops 48 hours or more after hospital admission and that was not incubating at hospital admission. When managed in hospital the diagnosis is usually confirmed by chest X-ray. For the purpose of this guideline, pneumonia that develops in hospital after intubation (ventilator-associated pneumonia) is excluded from this definition.

Lower respiratory tract infection An acute illness (present for 21 days or less), usually with cough as the main symptom, and with at least 1 other lower respiratory tract symptom (such as fever, sputum production, breathlessness, wheeze or chest discomfort or pain) and no alternative explanation (such as sinusitis or asthma). Pneumonia, acute bronchitis and exacerbation of chronic obstructive airways disease are included in this definition.

Mortality risk The percentage likelihood of death occurring in a patient in the next 30 days.

Severity assessment A judgement by the managing clinician as to the likelihood of adverse outcomes in a patient. This is based on a combination of clinical understanding and knowledge in addition to a mortality risk score. The difference between categories of severity and mortality risk can be important. Typically the mortality risk score will match the severity assessment. However, there may be situations where the mortality score does not accurately predict mortality risk and clinical judgement is needed. An example might be a patient with a low mortality risk score who has an unusually low oxygen level, who would be considered to have a severe illness.

1.1 Presentation with lower respiratory tract infection

1.1.1 For people presenting with symptoms of lower respiratory tract infection in primary care, consider a point of care C-reactive protein test if after clinical assessment a diagnosis of pneumonia has not been made and it is not clear whether antibiotics should be prescribed. Use the results of the C-reactive protein test to guide antibiotic prescribing in people without a clinical diagnosis of pneumonia as follows:

- Do not routinely offer antibiotic therapy if the C-reactive protein concentration is less than 20 mg/litre.
- Consider a delayed antibiotic prescription (a prescription for use at a later date if symptoms worsen) if the C-reactive protein concentration is between 20 mg/litre and 100 mg/litre.
- Offer antibiotic therapy if the C-reactive protein concentration is greater than 100 mg/litre.

1.2 Community-acquired pneumonia

Severity assessment in primary care

1.2.1 When a clinical diagnosis of community-acquired pneumonia is made in primary care, determine whether patients are at low, intermediate or high risk of death using the CRB65 score (see box 1).

Box 1 CRB65 score for mortality risk assessment in primary care[a]

CRB65 score is calculated by giving 1 point for each of the following prognostic features:

- confusion (abbreviated Mental Test score 8 or less, or new disorientation in person, place or time)[b]
- raised respiratory rate (30 breaths per minute or more)
- low blood pressure (diastolic 60 mmHg or less, or systolic less than 90 mmHg)
- age 65 years or more.

Patients are stratified for risk of death as follows:

- 0: low risk (less than 1% mortality risk)
- 1 or 2: intermediate risk (1-10% mortality risk)
- 3 or 4: high risk (more than 10% mortality risk).

[a] Lim WS, van der Eerden MM, Laing R, et al. (2003) Defining community-acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax 58: 377–82

[b] For guidance on delirium, see the NICE guideline on delirium.

1.2.2 Use clinical judgement in conjunction with the CRB65 score to inform decisions about whether patients need hospital assessment as follows:

- consider home-based care for patients with a CRB65 score of 0
- consider hospital assessment for all other patients, particularly those with a CRB65 score of 2 or more.

Severity assessment in hospital

1.2.3 When a diagnosis of community-acquired pneumonia is made at presentation to hospital, determine whether patients are at low, intermediate or high risk of death using the CURB65 score (see box 2).

Box 2 CURB65 score for mortality risk assessment in hospital[a]

CURB65 score is calculated by giving 1 point for each of the following prognostic features:

- confusion (abbreviated Mental Test score 8 or less, or new disorientation in person, place or time)[b]
- raised blood urea nitrogen (over 7 mmol/litre)
- raised respiratory rate (30 breaths per minute or more)
- low blood pressure (diastolic 60 mmHg or less, or systolic less than 90 mmHg)
- age 65 years or more.

Patients are stratified for risk of death as follows:

- 0 or 1: low risk (less than 3% mortality risk)
- 2: intermediate risk (3-15% mortality risk)
- 3 to 5: high risk (more than 15% mortality risk).

[a] Lim WS, van der Eerden MM, Laing R, et al. (2003) Defining community-acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax 58: 377–82

[b] For guidance on delirium, see the NICE guideline on delirium.

1.2.4 Use clinical judgement in conjunction with the CURB65 score to guide the management of community-acquired pneumonia, as follows:

- consider home-based care for patients with a CURB65 score of 0 or 1
- consider hospital-based care for patients with a CURB65 score of 2 or more
- consider intensive care assessment for patients with a CURB65 score of 3 or more.

1.2.5 Stratify patients presenting with community-acquired pneumonia into those with low-, moderate- or high-severity disease. The grade of severity will usually correspond to the risk of death.

Microbiological tests

1.2.6 Do not routinely offer microbiological tests to patients with low-severity community-acquired pneumonia.

1.2.7 For patients with moderate- or high-severity community-acquired pneumonia:

- take blood and sputum cultures **and**
- consider pneumococcal and legionella urinary antigen tests.

Timely diagnosis and treatment

1.2.8 Put in place processes to allow diagnosis (including X-rays) and treatment of community-acquired pneumonia within 4 hours of presentation to hospital.

1.2.9 Offer antibiotic therapy as soon as possible after diagnosis, and certainly within 4 hours to all patients with community-acquired pneumonia who are admitted to hospital.

Antibiotic therapy

Low-severity community-acquired pneumonia

1.2.10 Offer a 5-day course of a single antibiotic to patients with low-severity community-acquired pneumonia.

1.2.11 Consider amoxicillin in preference to a macrolide or a tetracycline for patients with low-severity community-acquired pneumonia. Consider a macrolide or a tetracycline for patients who are allergic to penicillin.

1.2.12 Consider extending the course of the antibiotic for longer than 5 days as a possible management strategy for patients with low-severity community-acquired pneumonia whose symptoms do not improve as expected after 3 days.

1.2.13 Explain to patients with low-severity community-acquired pneumonia treated in the community, and when appropriate their families or carers, that they should

seek further medical advice if their symptoms do not begin to improve within 3 days of starting the antibiotic, or earlier if their symptoms are worsening.

1.2.14 Do not routinely offer patients with low-severity community-acquired pneumonia:

- a fluoroquinolone
- dual antibiotic therapy.

Moderate- and high-severity community-acquired pneumonia

1.2.15 Consider a 7- to 10-day course of antibiotic therapy for patients with moderate- or high-severity community-acquired pneumonia.

1.2.16 Consider dual antibiotic therapy with amoxicillin and a macrolide for patients with moderate-severity community-acquired pneumonia.

1.2.17 Consider dual antibiotic therapy with a beta-lactamase stable beta-lactam[1] and a macrolide for patients with high-severity community-acquired pneumonia.

Glucocorticosteroid treatment

1.2.18 Do not routinely offer a glucocorticosteroid to patients with community-acquired pneumonia unless they have other conditions for which glucocorticosteroid treatment is indicated.

Monitoring in hospital

1.2.19 Consider measuring a baseline C-reactive protein concentration in patients with community-acquired pneumonia on admission to hospital, and repeat the test if clinical progress is uncertain after 48 to 72 hours.

Safe discharge from hospital

1.2.20 Do not routinely discharge patients with community-acquired pneumonia if in the past 24 hours they have had 2 or more of the following findings:

- temperature higher than 37.5°C
- respiratory rate 24 breaths per minute or more
- heart rate over 100 beats per minute
- systolic blood pressure 90 mmHg or less
- oxygen saturation under 90% on room air
- abnormal mental status
- inability to eat without assistance.

1.2.21 Consider delaying discharge for patients with community-acquired pneumonia if their temperature is higher than 37.5°C.

Patient information

1.2.22 Explain to patients with community-acquired pneumonia that after starting treatment their symptoms should steadily improve, although the rate of improvement will vary with the severity of the pneumonia, and most people can expect that by:

- 1 week: fever should have resolved
- 4 weeks: chest pain and sputum production should have substantially reduced
- 6 weeks: cough and breathlessness should have substantially reduced
- 3 months: most symptoms should have resolved but fatigue may still be present
- 6 months: most people will feel back to normal.

1.2.23 Advise patients with community-acquired pneumonia to consult their healthcare professional if they feel that their condition is deteriorating or not improving as expected.

1.3 Hospital-acquired pneumonia

Antibiotic therapy

1.3.1 Offer antibiotic therapy as soon as possible after diagnosis, and certainly within 4 hours, to patients with hospital-acquired pneumonia.

1.3.2 Choose antibiotic therapy in accordance with local hospital policy (which should take into account knowledge of local microbial pathogens) and clinical circumstances for patients with hospital-acquired pneumonia.

1.3.3 Consider a 5- to 10-day course of antibiotic therapy for patients with hospital-acquired pneumonia.

[1] Available beta-lactamase stable beta-lactams include: co-amoxiclav, cefotaxime, ceftaroline fosamil, ceftriaxone, cefuroxime and piperacillin with tazobactam.

2 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future.

2.1 Urine antigen testing

In moderate- to high-severity community-acquired pneumonia does using legionella and pneumococcal urinary antigen testing in addition to other routine tests improve outcomes?

Why this is important

Current practice and evidence suggest that giving a combination of antibiotics to patients with moderate- to high-severity community-acquired pneumonia reduces mortality. However, no randomised controlled trial has looked at using urinary antigen testing to target treatment. If effective, such targeted treatment could improve antibiotic stewardship, increase compliance and potentially reduce costs.

2.2 C-reactive protein guided antibiotic duration

In patients hospitalised with moderate- to high-severity community-acquired pneumonia, does using C-reactive protein monitoring in addition to clinical observation to guide antibiotic duration safely reduce the total duration of antibiotic therapy compared with a fixed empirical antibiotic course?

Why this is important

The recommended duration of antibiotic therapy for adults hospitalised with moderate- to high-severity community-acquired pneumonia is based on evidence of very low quality; no relevant clinical trials were identified by NICE. The burden of community-acquired pneumonia is large, and its treatment accounts for a high proportion of antibiotic use in hospitals. Overuse of antibiotics is associated with antimicrobial resistance, which is a national and global priority.

2.3 Continuous positive pressure ventilation

What is the clinical effectiveness of continuous positive pressure ventilation compared with usual care in patients with community-acquired pneumonia and type I respiratory failure without a history of chronic obstructive pulmonary disease?

Why this is important

Type I respiratory failure is a common feature of pneumonia. Mild type I respiratory failure is easily corrected with low levels of supplemental oxygen, whereas severe life-threatening hypoxemia needs immediate intubation and invasive ventilation. Research into whether continuous positive pressure ventilation improves gas exchange and subsequent outcomes, such as mortality, could help improve care for patients with respiratory failure between these extremes.

2.4 Hospital-acquired pneumonia

Can rapid microbiological diagnosis of hospital-acquired pneumonia reduce the use of extended-spectrum antibiotic therapy, without adversely affecting outcomes?

Why this is important

Data are limited on the microbiology of hospital-acquired pneumonia to guide antibiotic therapy. Hospital-acquired infections can be caused by highly resistant pathogens that need treatment with extended-spectrum antibiotics (for example, extended-spectrum penicillins, third-generation cephalosporins, aminoglycosides, carbapenems, linezolid, vancomycin, or teicoplanin), as recommended by British Society of Antimicrobial Chemotherapy guidance. Because routine microbial tests lack sensitivity and take 24–48 hours to identify a causative pathogen, patient characteristics are used to guide antibiotic choice. However, this may lead to unnecessary use of extended-spectrum antibiotics in patients infected with non-resistant organisms, and inappropriate use of first-line antibiotics (such as beta-lactam stable penicillins, macrolides or doxycycline) in patients infected with resistant organisms.

Rapid diagnostic tests to identify causative bacterial pathogens and determine whether they are resistant to antibiotics may have a role in guiding antibiotic choice for postoperative hospital-acquired pneumonia.

To limit population variability and include high-risk patients spending time in intensive care, studies should include postoperative patients from different surgical specialties.

3 Other information

3.1 Scope and how this guideline was developed

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover.

How this guideline was developed

NICE commissioned the National Clinical Guideline Centre to develop this guideline. The Centre established a Guideline Development Group (see section 4), which reviewed the evidence and developed the recommendations.

The methods and processes for developing NICE clinical guidelines are described in the guidelines manual.

3.2 Related NICE guidance

Details are correct at the time of publication of the guideline (December 2014). Further information is available on the NICE website.

Published

General

- Drug allergy (2014) NICE guideline CG183
- Patient experience in adult NHS services (2012) NICE guideline CG138
- Delirium (2010) NICE guideline CG103
- Medicines adherence (2009) NICE guideline CG76

Condition-specific

- Extracorporeal membrane carbon dioxide removal (2012) NICE interventional procedures guidance 428
- Infection (2012) NICE guideline CG139

- Prevention and control of healthcare-associated infections (2011) NICE guideline PH36
- Extracorporeal membrane oxygenation for severe acute respiratory failure in adults (2011) NICE interventional procedures guidance 391
- Respiratory tract infections – antibiotic prescribing (2008) NICE guideline CG69
- Technical patient safety solutions for ventilator-associated pneumonia in adults (2008) NICE patient safety guidance 2

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About this guideline

NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions.

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover.

This guideline was developed by the National Clinical Guideline Centre, which is based at the Royal College of Physicians. The Guideline Centre worked with a Guideline Development Group, comprising healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, which reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

The methods and processes for developing NICE clinical guidelines are described in the guidelines manual.

NICE produces guidance, standards and information on commissioning and providing high-quality healthcare, social care, and public health services. We have agreements to provide certain NICE services to Wales, Scotland and Northern Ireland. Decisions on how NICE guidance and other products apply in those countries are made by ministers in the Welsh government, Scottish government, and Northern Ireland Executive. NICE guidance or other products may include references to organisations or people responsible for commissioning or providing care that may be relevant only to England.

Strength of recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the Guideline Development Group is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

For all recommendations, NICE expects that there is discussion with the patient about the risks and benefits of the interventions, and their values and preferences. This discussion aims to help them to reach a fully informed decision (see also patient-centred care).

Interventions that must (or must not) be used

We usually use 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally we use 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions that should (or should not) be used – a 'strong' recommendation

We use 'offer' (and similar words such as 'refer' or 'advise') when we are confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. We use similar forms of words (for example, 'Do not offer…') when we are confident that an intervention will not be of benefit for most patients.

Interventions that could be used

We use 'consider' when we are confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Other versions of this guideline

The full guideline, Pneumonia: Diagnosis and management of community- and hospital-acquired pneumonia in adults, contains details of the methods and evidence used to develop the guideline. It is published by the National Clinical Guideline Centre.

The recommendations from this guideline have been incorporated into a NICE pathway.

We have produced information for the public about this guideline.

Implementation

Implementation tools and resources to help you put the guideline into practice are also available.

Your responsibility

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summaries of product characteristics of any drugs.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

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