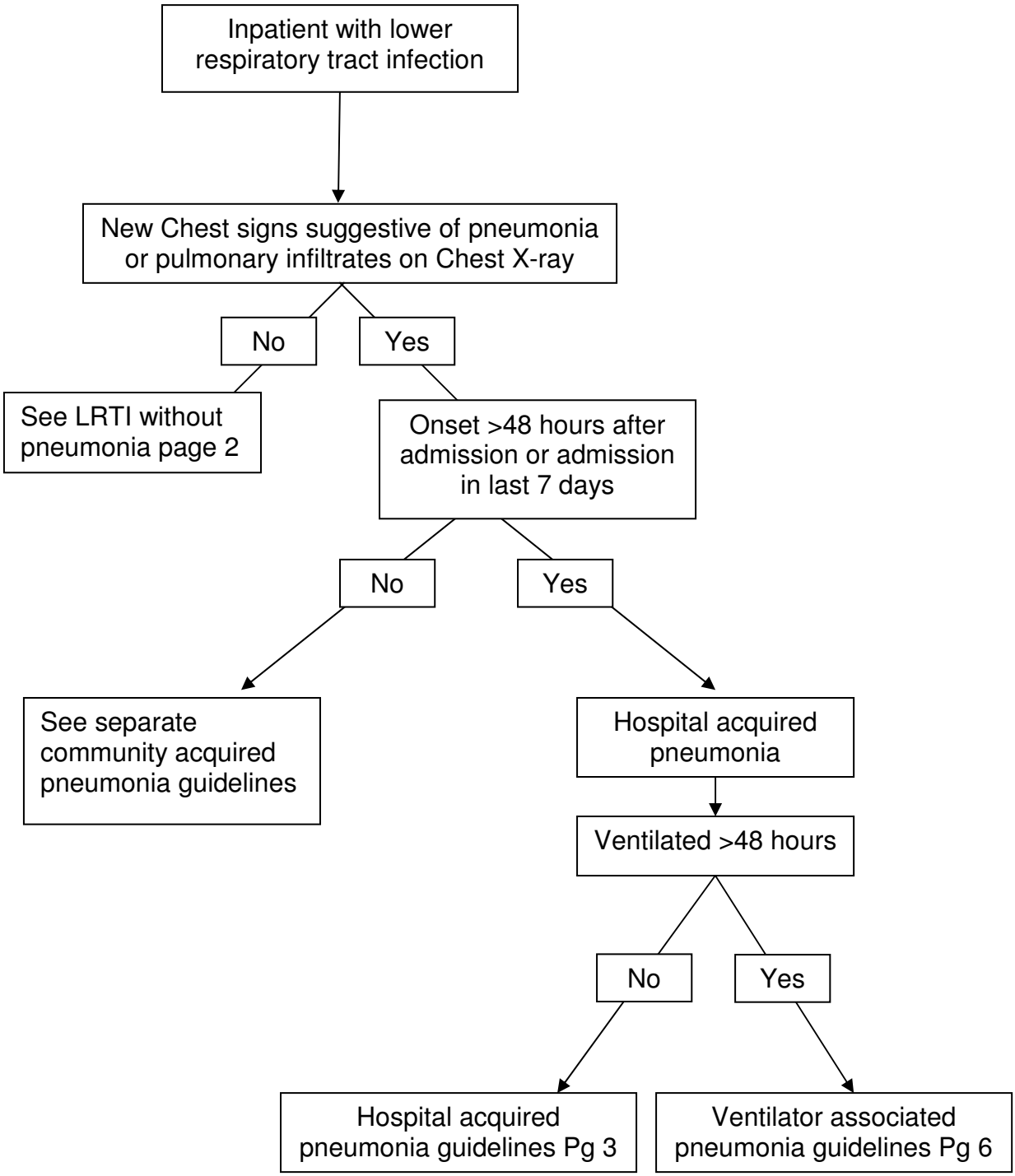
Guidelines for the Management of Lower Respiratory Tract Infection (LRTI) and Hospital Acquired Pneumonia in Adults

Version	• 3.1
Date ratified	• June 2008 (minor update January 2009)
Review date	• June 2010
Ratified by	• Nottingham University Hospitals Antimicrobial Guidelines and Drugs and Therapeutics Committees
Authors	• Vivienne Weston
Consultation:	• Respiratory Consultants Drs Lim and Wharton • Critical care lead consultant Dr Selwyn • Microbiology consultants. • Members of Nottingham Hospitals Antibiotic Guidelines Committee. Consultants Drs Weston, Soo, Wharton, Byrne, Professor Finch. Pharmacists Tim Hills, Annette Clarkson, Maureen Milligan and Sarah Pacey.
Evidence Base	• Local microbiological sensitivity surveillance • ATS Guidelines for the Management of Adults with Hospital-acquired, Ventilator-acquired and Healthcare –associated Pneumonia 2005. • Guidelines for the management of hospital-acquired pneumonia in the UK: report of the Working Party on HAP of the BSAC 2008 • Recommended best practice based on clinical experience of guideline developers
Changes from previous Guideline	• VAP guidance merged • Further restriction in the use of quinolones- removed levofloxacin for non-pneumonic LRTI • Minor update January 2009 where " Tazocin® " was advised it has been replaced by Piperacillin/Tazobactam
Audit	• Annual Directorate Audit Plans as appropriate
Distribution	• Antibiotic websites • Consultants via trust e-mail.
Local Contacts	Dr Vivienne Weston, Consultant Microbiologist, QMC Ext 64179 E-mail vivienne.weston@nuh.nhs.uk

This guideline has been registered with the Trust. However, clinical guidelines are 'guidelines' only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt consult a senior colleague or expert. Caution is advised when using guidelines after the review date.

Guidelines for the Management of Lower Respiratory Tract Infection (LRTI) and Hospital Acquired Pneumonia in Adults

These guidelines are intended for the antibiotic treatment of LRTI in immunocompetent adults. Please see separate guidelines for the treatment of severely immunocompromised (neutropenic) patient.



Non-Pneumonic LRTI including Infective Exacerbation of Asthma/COPD

Evidence of Benefit
In otherwise healthy individuals, antibiotics are of limited benefit.
Antibiotics not indicated in absence of purulent/mucopurulent sputum. They are of most benefit if the patient has increased dyspnoea and increased purulent sputum.

Clinical Features
Fever with purulent sputum with no change in the chest X-ray, suggests acute tracheo-bronchitis.

Core Pathogens

S. pneumoniae, H. influenzae, S. aureus.
Respiratory viruses
Moraxella catarrhalis (particularly in chronic lung disease)
(Enteric Gram-negative bacilli- pathogenicity remains unclear)

Samples to be taken prior to starting antibiotics

1) Sputum for culture (if productive cough or produced after physiotherapy)
2) Blood cultures if pyrexial or unwell

Other samples which may be indicated

- Sputum or throat swab for viral culture and immunofluorescence if immunocompromised patient or features suggestive of influenza infection during influenza season

Antibiotic treatment non-pneumonic LRTI
Antibiotics not always indicated see above
Caution; antibiotics may require dose adjustment in renal impairment, if unsure discuss with a ward pharmacist or check NUH guideline on antibiotic doses in renal impairment for adults (available on the antibiotic website http://nuhweb/antibiotics)

- 1st line: PO **Doxycycline** 100mg bd for 1 day followed by 100mg od for 4 days
- If failed recent course of doxycycline:

  PO **Co-amoxiclav** 375mg tds and **Amoxicillin** 250mg tds for 5 days

- If nil by mouth IV **Co-amoxiclav** 1.2 g tds (can be converted to PO once taking oral medication) for 5 days (IV **Cefuroxime** 1.5g tds if non-severe penicillin allergy [e.g.mild rash only], if severe allergy discuss with a medical microbiologist)

Hospital-acquired pneumonia

Definition
Hospital acquired pneumonia (HAP) is defined as a pneumonia that occurs 48 hours or longer after hospital admission and excludes any infection that is incubating at the time of admission.
Ventilator-associated pneumonia (VAP) is pneumonia developing after at least 48 hours of mechanical ventilation and is a subgroup of HAP.

Clinical features
Fever, purulent sputum or tracheal secretions, Core temperature >38.3C, leucocytosis >11x 10^9/L or leucopenia (<4x 10^9/L),increased oxygen requirements new and or persistent pulmonary infiltrates on chest X-ray which is otherwise unexplained occurring 48 hours or more after hospital admission.

Severe HAP
Assessing severity is the key to deciding general and antimicrobial management. Unlike community-acquired pneumonia (CAP), there are not any published British evidence-based guidelines available to aid clinical judgment in assessing the severity of HAP. However the following features in addition to the clinical features would suggest severe pneumonia, but these may be present due to underlying disease or other causes e.g. sepsis.

- New mental confusion
- Respiratory rate 30/min or more
- Hypoxia (PaO_2<8 kPa or SaO_2 <92% on any FiO2)
- Bilateral or multilobular chest X-ray shadowing
- Blood pressure Systolic BP <90 or diastolic $\leq$ 60 mmHg
- Need for ventilatory support

The absence of these features would make severe pneumonia unlikely

Hospital-acquired pneumonia (not VAP)

Microbiology

Core Bacterial Pathogens (if no previous antibiotics)

S.pneumoniae, H. influenzae, S. aureus and sensitive enteric Gram negative bacilli.

Additional pathogens to consider in certain circumstances

Pseudomonas aeruginosa	In immunocompromised patients, patients who have recently been on ICU, had prior antibiotic therapy or with structural lung disease e.g. bronchiectasis.
Anaerobes	If the patient has a history suggestive of aspiration as a precipitating cause or radiographic evidence of abscess formation.

MRSA	In patients from a nursing home with a long-term urinary catheter or breaks in the skin; Recent stay on ICU; On ward with endemic MRSA; Known colonisation with MRSA. In Nottingham nearly all strains are sensitive to gentamicin and the tetracycline, doxycycline.
Legionella sp.	Rare cause of HAP. In immunocompromised patients or if there are signs suggesting an atypical infection, infection with *Legionella sp.* must also be considered and microbiology contacted to discuss the investigation and management of the case. As the standard recommended antibiotic regimens do not cover *Legionella sp*.

Samples to be taken prior to starting antibiotics

1) Sputum for culture (if productive cough or produced after physiotherapy if antibiotic therapy won't be delayed).
2) Blood cultures.

Other specimens which may be indicated

- Sputum or throat swab for viral culture and immunofluorescence if immunocompromised patient or features suggestive of influenza infection during influenza season

Antibiotic treatment HAP

Caution; antibiotics may require dose adjustment in renal impairment, if unsure discuss with a ward pharmacist or check NUH guideline on antibiotic doses in renal impairment for adults (available on the antibiotic website http://nuhweb/antibiotics)

The choice of antibiotic is determined by the severity of pneumonia (see criteria page 4), the likelihood that the pneumonia is secondary to aspiration, the presence of chronic respiratory infection e.g. bronchiectasis and recent microbiology results. Routine antibiotic treatment is not indicated for aspiration, unless there is persistence of chest signs, or fever 48 hours after the episode of aspiration, when the patient should be treated for aspiration pneumonia see below.
Prior microbiology results should be taken into consideration when selecting the appropriate therapy from the options given below. Medical microbiology advice is available if required.

Non-severe disease
(Review diagnosis with CXR and see non-pneumonic guidance above)

PO **Co-amoxiclav** 625 mg tds for 5 to 7 days (dispensed as **Co-amoxiclav** 375mg with **Amoxicillin** 250mg tds) [if NBM IV **Co-amoxiclav** 1.2g tds and convert to oral once route available]

If penicillin allergy
PO **Levofloxacin 500mg od** for up to 5 to 7 days (if NBM IV **Cefuroxime** 1.5g tds, but discuss with microbiology if anaphylaxis with penicillins or cephalosporin allergy)
[If aspiration of concern add IV **Metronidazole** 500mg tds]

Severe disease

IV **Co-amoxiclav** 1.2 g tds for up to 5 to 7 days (with switch to oral dosing as above if clinically improved and oral route not compromised) with a single dose of **Gentamicin** 5mg/kg[1] (reduce dose if CrCl <40 ml/min see website, max. dose 500mg)

Rash (not anaphylaxis) with penicillins
IV Cefuroxime 1.5g tds for up to 5 to 7 days (with switch to oral dosing as above if clinically improved and oral route not compromised) with a single dose of **Gentamicin**[1] 5mg/kg (reduce dose if CrCl <40 ml/min see website, max. dose 500mg) [if aspiration of concern add IV **Metronidazole** 500mg tds]

Anaphylaxis with penicillins
PO **Levofloxacin** 500mg bd with IV **Vancomycin** 1g bd (reduce dose if >65 years or renal impairment) [monitor levels] for upto 7 days
[if aspiration of concern add IV **Metronidazole** 500mg tds]
If nil by mouth discuss choice with a medical microbiologist

The diagnosis, severity of disease, antibiotic treatment and the need for IV treatment should be reviewed the following day, the IV-PO switch guideline is available on the antibiotics website http://nuhweb/antibiotics

[1] Further doses of gentamicin may be required if the patient is still unwell with signs of severe disease the following day, pending further microbiological results. Check an 18-24 hour trough level if further doses are required. The second dose may be given, before the result is available, unless the patient:

- Is ≥ 65 years of age
- Has renal impairment
- Has poor urine output

In these patients **wait** for the result of the trough level and only give further doses if level <1 mg/L (if level above 1mg/L discuss with medical microbiologist).

ITU-Ventilator-associated pneumonia (VAP)

Definition

Pneumonia developing after at least 48 hours (2 days) of mechanical ventilation. For patients who develop pneumonia within the first 48 hours please refer to HAP or CAP guidelines as appropriate.

The clinical features that suggest VAP i.e. purulent secretions and new and /or persistent infiltrate on CXR which is otherwise unexplained, increased oxygen requirement, Blood leucocytosis (>10 x 10^9/L) or leucopenia (<4x 10^9/L), core temperature >38.3^{o}C can mimic acute respiratory distress syndrome, which may lead to an over- or under-diagnosis of VAP. Positive tracheal secretions cultures are non-specific and should not be used alone to guide therapy, whereas bronchoalveolar lavage specimens have been shown to be helpful. In patients who are admitted to ITU from the community and ventilated for less than 4 days the range of likely pathogens is different to those who are admitted from a ward or ventilated for 4 days or more.

Microbiology

Community admission ventilated 2-4 days
Likely causative organisms are *H. influenzae, S. pneumoniae*, sensitive enteric Gram-negative bacilli and *S. aureus* if no prior antibiotic therapy.

Inpatient or ventilated for >4 days
Likely causative organisms are Gram-negative bacilli, *Pseudomonas aeruginosa,* MRSA (and rarely *Legionella sp.*).

Samples to be taken prior to starting antibiotics

1) Tracheal aspirate for culture +/- Bronchoalveolar lavage (If BAL ring microbiology and ask for an urgent Gram stain)
2) Blood cultures
3) Serum and urine for pneumococcal and legionella testing if atypical features
4) Sputum or throat swab for viral culture and immunoflourescence if immunocompromised patient or features suggestive of influenza infection during influenza season

Antibiotic treatment

Community admission ventilated <2 days please refer to separate CAP guidance. Initial therapy should be started as soon as VAP is suspected, after cultures have been taken.

Community admission ventilated 2-4 days

IV Co-amoxiclav 1.2 g tds for 7 days (**Cefuroxime** 1.5g tds **if rash [not anaphylaxis]) with penicillins)** PLUS a single dose of **Gentamicin**[1] 5mg/kg (reduce dose if CrCl <40 ml/min see website, given as an infusion over 20-30 minutes, max. dose 500mg) if in septic shock and review the following day.

Discuss therapy if prior antibiotics or anaphylaxis with Beta-lactam antibiotics (i.e. penicillins, cephalosporins and carbapenems)

Inpatient or ventilated >4 days

IV **Piperacillin/Tazobactam** 4.5g tds for 7 days (if non –severe penicillin allergy IV meropenem 1g tds) PLUS IV **Vancomycin** 1g BD (reduce dose if >65 years or renal impairment) [monitor levels and aim for a pre dose (trough) level of 10-15 mg/L]
Discuss therapy if prior antibiotics or anaphylaxis with Beta-lactam antibiotics (i.e. penicillins, cephalosporins and carbapenems)

Antibiotic treatment should be reviewed at 48 hours when microbiology results become available.

Length of treatment and specific infections
Usual duration 7 days if clinical response
May be extended to 10-14 days if *S. aureus* or *Pseudomonas aeruginosa* infections if slow clinical response
In MRSA VAP if unresponsive to vancomcycin despite adequate trough levels consider changing to or adding PO or IV Linezolid 600mg bd (if not contraindicated by drug interactions- discuss with pharmacy).Requires approval from microbiology
NB: Oral bioavailability of linezolid is approximately 100%.

[1] Further doses of gentamicin may be required if the patient is still unwell with signs of severe disease the following day, pending further microbiological results. Check an 18-24 hour trough level if further doses are required. The second dose may be given, before the result is available, **unless** the patient:

- Is ≥ 65 years of age
- Has renal impairment
- Has poor urine output

In these patients **wait** for the result of the trough level and only give further doses if level <1 mg/L. (if level above 1mg/L discuss with medical microbiologist).