Community-acquired pneumonia (CAP) in adults

Case definition & exclusion criteria

Case definition[1,2]: New or worsening shadowing on the chest X-ray or CT of a patient with clinical features which usually include cough, fever (>38C) and difficulty breathing (although these clinical features may be absent, e.g. older patients)

Exclusions (refer to relevant guideline or seek senior advice)[1,2]

•Septic shock; immunocompromised; hospital-acquired pneumonia; bronchiectasis; pneumonia expected as terminal event

Evidence of infection[3]

• One respiratory complaint (including cough, chest pain or shortness of breath) **AND**

•At least one abnormality of the vital signs (temperature >38C; pulse >100/min; respiration rate >20/min; or pulse oximetry <95% on room air) [Sensitivity 90%, specificity 76% for X-ray confirmed CAP]

•If both, order X-ray and start provisional antibiotics according to severity (see table below)

•If no vital signs abnormality, order X-ray; withhold antibiotics until X-ray result and if X-ray negative, withhold antibiotics and monitor patient

Risk of antibiotic resistance[4]

•Recent travel to Europe or USA – risk of penicillin-resistant pneumococcus (use high-dose penicillin or cephalosporin)[5]

•Nursing home resident – (no adjustment to CAP regimen recommended for the UK)[6,7]

• Alcohol dependence / homelessness – risk of Gram-negative enteric bacilli & Klebsiella (treat as high-severity CAP)[6]

• Risk of Pseudomonas – bronchiectasis/interstitial lung disease or enteral tube feeding[8]

• If recent hospital admission, REVIEW PREVIOUS MC&S (check eQuest) to guide therapy

Typical pathogen profile[6]

Gram positive
- *Streptococcus pneumoniae 39%*
- *Staphylococcus aureus 1.9%*

Gram negative
- *Haemophilus influenzae 5.2%*
- *Moraxella catarrhalis 1.9%*
- *Gram-negative bacilli 1.9%*

Anaerobes
- Consider in nursing home residents

Atypicals
- *Legionella spp. 3.6%*
- *Mycoplasma pneumoniae 10.8%*
- *Chlamydophila pneumoniae 13.1%*
- *Chlamydophila psittaci 2.6%*
- *Coxiella burnetii 1.2%*

Viruses, including influenza 13%

Severity assessment [4,6,9,10]

Severity criteria[4]:
- **C**onfusion/disorientation
- **U**rea >7mmol/L
- **R**espiratory rate ≥30/min
- **B**P systolic <90 mmHg
- **O_2** sats on room air <86%
- **M**ultilobar infiltrates

High severity (≥3 criteria)
- ≥3 criteria: consider referral to critical care

Moderate severity
- 0-2 criteria: treat on ward as moderate severity CAP
- Reassess regularly

Microbiology investigations[1,2]

• take blood and sputum cultures and combined nose & throat swab for influenza and other respiratory virus detection

•consider pneumococcal and legionella urinary antigen tests (by consultant request) for patients managed as high-severity CAP

Therapy[2,4,5,6]

•*Review treatment choice pre-72 hours according to MC&S results and response*

§ Agents considered lower risk for *Clostridium difficile* [NICE advice (ESMPB1), March 2015]

Severity & course length	Risk factors for antibiotic resistance	First-line (irrespective of *Clostridium difficile* risk)	Alternative (e.g. if penicillin allergy)
Moderate severity CAP Treat for 5 days[4,19] (azithromycin for 3 days only)	No resistance risk factors	•**amoxicillin** (**not** if penicillin allergy) 500mg oral 8-hourly • PLUS **doxycycline** § (**not** if pregnant*) 200mg oral 12-hourly for 48 hours then 200mg oral once-daily[11] If nil-by-mouth or not absorbing: • **benzylpenicillin** § (**not** if penicillin allergy) 1.2g IV 6-hourly[12] • PLUS **azithromycin** 500mg IV once-daily[13] *doxycycline contra-indicated in **pregnancy**, substitute azithromycin 500mg oral once-daily	If **pregnant**, contact microbiology If high-risk for *Clostridium difficile*: • **co-trimoxazole** § 960mg oral 12-hourly (monotherapy) OR (if nil-by-mouth or not absorbing): • **chloramphenicol** § 12.5mg/kg IV 6-hourly[14] (monotherapy) If low-risk for *Clostridium difficile*: •**Moxifloxacin** 400mg oral/IV once-daily (monotherapy)
	HIGH RISK of resistance	Alcohol dependence / homelessness: treat as per high-severity CAP patients	
High-severity CAP (≥3 severity criteria) OR if treated on HDU/ICU Treat for 5 days if good clinical response[18] (azithromycin for 3 days only; see duration guide)	No resistance risk factors	Choose from[2,15]: • **cefuroxime** (**not** if severe penicillin allergy) 1.5g IV 8-hourly • PLUS **azithromycin** 500mg oral/IV once-daily OR • **co-amoxiclav** (**not** if penicillin allergy) 1.2g IV 8-hourly • PLUS **azithromycin** 500mg oral/IV once-daily	Irrespective of *Clostridium difficile* risk: • **moxifloxacin*** 400 mg IV once-daily[12] (monotherapy) *moxifloxacin contra-indicated in **pregnancy** – contact microbiology for advice
		Oral switch criteria[16]: haemodynamic stability; + RR≤24; + O_2 saturations >90%; + temperature decrease of at least 1° C (if fever); + absence of mental confusion; + ability to take oral drugs.	
		Check MC&S results and direct therapy at the pathogen, OR • **cefaclor** (**not** if severe penicillin allergy) 500mg oral 8-hourly[2] OR • **co-amoxiclav** (**not** if penicillin allergy) 625mg oral 8-hourly	• **moxifloxacin*** 400 mg oral once-daily[12] (monotherapy) *moxifloxacin contra-indicated in **pregnancy** – contact microbiology for advice
	HIGH RISK of *Pseudomonas aeruginosa* (anticipated in fewer than 1% of all CAP patients)[8]	• bronchiectasis / interstitial lung disease OR • enteral tube feeding OR • known recent colonisation or infection with *Pseudomonas aeruginosa* (check eQuest) •**piperacillin-tazobactam** (**not** if penicillin allergy) 4.5g IV 8-hourly PLUS **gentamicin** 3mg/kg IV bolus single stat dose	If **penicillin-allergic or pregnant**, contact microbiology for advice **Oral switch** (see criteria above; check MC&S results first): • **ciprofloxacin** 750mg oral 12-hourly (monotherapy)

UHS Antibiotic Therapy *hi*Guide

Follow-up: Halm's stability criteria[4,17]

1. Temp ≤37.8C
2. HR ≤100
3. RR ≤24
4. Systolic BP ≥90mmHg
5. O2 sats ≥90%
6. (Normal mental status)
7. (Normal oral intake)

Time to stability

- Median time to achieve individual criteria is 2-3 days
- Median time to achieve all of first 5 stability criteria is 4 days
- Expect 70% to achieve 4 of first 5 stability criteria by day 5.[18]

Duration guide[2,4,18,19,20]

Hospitalised, moderate severity, treat for 5 days[4,19] if:

- body temperature ≤37.8C for 48 hours

Hospitalised, high severity, treat for 5-7 days; stop at 5 days[18,20] if:

- body temperature ≤37.8C for 48 hours AND
- No more than one sign of instability (Halm's criteria 1-5) AND
- patient not immunosuppressed, not on ICU, no chest drain required and no Legionella / Gram-negative enteric bacilli / Pseudomonas / *Staph aureus* from MC&S results

•Parapneumonic effusions develop in 36–57% and can be the cause of persisting pyrexia despite adequate antibiotic treatment; early thoracentesis indicated. Empyema is rare (0.7-1.3%).[6]

In vitro antibiotic susceptibility for CAP pathogens

(local data from 2015; UHS respiratory specimens (excluding cystic fibrosis) from primary and secondary care; presented as % susceptible)

	Gram +ve	Gram +ve	Gram -ve	Gram –ve	Atypicals	
Drug\Organism	*S. pneumoniae*	*Staph. aureus*	*Haemophilus influenzae*	Enteric bacilli	*Legionella*	*Chlamydophila Mycoplasma* etc
Prevalence in CAP (NICE 2014; BTS 2009 n=1137)	**39%**	**1.9%**	**5.2%**	**1.9%**	**3.6%**	**27.7%**
Benzylpenicillin	100%	23%	0	-	0	0
Amoxicillin	100%	+/-	68%	31%	0	0
Co-amoxiclav	100%	+	94%	55%	0	0
Cefuroxime	98%	+	94%	-	0	0
Pip-taz	100%	+	94%	93%	0	0
Doxycycline	78%	93%	99%	-	+	++
Co-trimoxazole	87%	+	+	-	+	0
Chloramphenicol	100%	99%	98%	63%	+	+
Erythromycin/Clari/Azithro	80%	76%	99%	-	++	++
Moxifloxacin	+	+	++	-	++	++
Ciprofloxacin	+/-	91%	98%	88%	++	+

Sanford Guide accessed April 2016: ++ first-line; + second-line (active in vitro); +/- variable activity; 0 not recommended; N/A no activity; - no data

Authors: Hand K, Armstrong L, Bhullar J, Gilson S, Lillie P, Marshall B, Sutton J, Virk H
Authorising committee: UHS Drugs Committee (December 2016)
Valid dates: 01 January 2017 to 31December 2020

Selected References (for full literature review, see CAP hiGuide Evidence Summary on Staffnet)

1. UHS local guideline development group consensus.
2. National Institute for Health and Care Excellence (UK). Pneumonia: Diagnosis and Management of Community- and Hospital-Acquired Pneumonia in Adults. Clinical Guideline CG191. 2014 Dec. http://www.ncbi.nlm.nih.gov/pubmed/25520986
3. Khalil A, Kelen G, Rothman RE. A simple screening tool for identification of community-acquired pneumonia in an inner city emergency department. *Emerg Med J*. 2007 May;24(5):336-8. http://www.ncbi.nlm.nih.gov/pubmed/17452700
4. Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, Dowell SF, File TM Jr, Musher DM, Niederman MS, Torres A, Whitney CG; Infectious Diseases Society of America; American Thoracic Society. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis*. 2007 Mar 1;44 Suppl 2:S27-72. http://www.ncbi.nlm.nih.gov/pubmed/17278083
5. Woodhead M, Blasi F, Ewig S, Garau J, Huchon G, Ieven M, Ortqvist A, Schaberg T, Torres A, van der Heijden G, Read R, Verheij TJ; Joint Taskforce of the European Respiratory Society and European Society for Clinical Microbiology and Infectious Diseases. Guidelines for the management of adult lower respiratory tract infections--full version. Clin Microbiol Infect. 2011 Nov;17 Suppl 6:E1-59. http://www.ncbi.nlm.nih.gov/pubmed/21951385
6. Lim WS, Baudouin SV, George RC, Hill AT, Jamieson C, Le Jeune I, Macfarlane JT, Read RC, Roberts HJ, Levy ML, Wani M, Woodhead MA; Pneumonia Guidelines Committee of the BTS Standards of Care Committee. BTS guidelines for the management of community acquired pneumonia in adults: update 2009. *Thorax*. 2009 Oct;64 Suppl 3:iii1-55. http://www.ncbi.nlm.nih.gov/pubmed/19783532
7. Chalmers JD, Rother C, Salih W, Ewig S. Healthcare-associated pneumonia does not accurately identify potentially resistant pathogens: a systematic review and meta-analysis. *Clin Infect Dis*. 2014 Feb;58(3):330-9. http://www.ncbi.nlm.nih.gov/pubmed/24270053
8. von Baum H, Welte T, Marre R, Suttorp N, Ewig S; CAPNETZ study group. Community-acquired pneumonia through Enterobacteriaceae and Pseudomonas aeruginosa: Diagnosis, incidence and predictors. *Eur Respir J*. 2010 Mar;35(3):598-605. http://www.ncbi.nlm.nih.gov/pubmed/19679601
9. Salih W, Schembri S, Chalmers JD. Simplification of the IDSA/ATS criteria for severe CAP using meta-analysis and observational data. *Eur Respir J*. 2014 Mar;43(3):842-51. http://www.ncbi.nlm.nih.gov/pubmed/24114960
10. Chalmers JD. Identifying severe community-acquired pneumonia: moving beyond mortality. *Thorax*. 2015 Jun;70(6):515-6. http://www.ncbi.nlm.nih.gov/pubmed/25877217
11. Teh B, Grayson ML, Johnson PD, Charles PG. Doxycycline vs. macrolides in combination therapy for treatment of community-acquired pneumonia. *Clin Microbiol Infect*. 2012 Apr;18(4):E71-3. http://www.ncbi.nlm.nih.gov/pubmed/22284533
12. Postma DF, van Werkhoven CH, van Elden LJ, Thijsen SF, Hoepelman AI, Kluytmans JA, Boersma WG, Compaijen CJ, van der Wall E, Prins JM, Oosterheert JJ, Bonten MJ; CAP-START Study Group. Antibiotic treatment strategies for community-acquired pneumonia in adults. *N Engl J Med*. 2015 Apr 2;372(14):1312-23. http://www.ncbi.nlm.nih.gov/pubmed/25830421
13. Laopaiboon M, Panpanich R, Swa Mya K. Azithromycin for acute lower respiratory tract infections. *Cochrane Database Syst Rev*. 2015 Mar 8;3:CD001954. http://www.ncbi.nlm.nih.gov/pubmed/25749735
14. Eliakim-Raz N, Lador A, Leibovici-Weissman Y, Elbaz M, Paul M, Leibovici L. Efficacy and safety of chloramphenicol: joining the revival of old antibiotics? Systematic review and meta-analysis of randomized controlled trials. *J Antimicrob Chemother*. 2015 Apr;70(4):979-96. http://www.ncbi.nlm.nih.gov/pubmed/25583746
15. Garin N, Genné D, Carballo S, Chuard C, Eich G, Hugli O, Lamy O, Nendaz M, Petignat PA, Perneger T, Rutschmann O, Seravalli L, Harbarth S, Perrier A. β-Lactam monotherapy vs β-lactam-macrolide combination treatment in moderately severe community-acquired pneumonia: a randomized noninferiority trial. *JAMA Intern Med*. 2014 Dec;174(12):1894-901. http://www.ncbi.nlm.nih.gov/pubmed/25286173
16. Oosterheert JJ, Bonten MJ, Schneider MM, et al. Effectiveness of early switch from intravenous to oral antibiotics in severe community acquired pneumonia: multicentre randomised trial. *BMJ* 2006; 333:1193. http://www.ncbi.nlm.nih.gov/pubmed/17090560
17. Halm EA, Fine MJ, Marrie TJ, Coley CM, Kapoor WN, Obrosky DS, Singer DE. Time to clinical stability in patients hospitalized with community-acquired pneumonia: implications for practice guidelines. JAMA. 1998 May 13;279(18):1452-7. http://www.ncbi.nlm.nih.gov/pubmed/9600479
18. Uranga A, España PP, Bilbao A, et al. Duration of Antibiotic Treatment in Community-Acquired Pneumonia: A Multicenter Randomized Clinical Trial. *JAMA Intern Med.* 2016;176(9):1257-1265
19. Dimopoulos G, Matthaiou DK, Karageorgopoulos DE, Grammatikos AP, Athanassa Z, Falagas ME. Short- versus long-course antibacterial therapy for community-acquired pneumonia : a meta-analysis. Drugs. 2008;68(13):1841. http://www.ncbi.nlm.nih.gov/pubmed/18729535
20. Choudhury G, Mandal P, Singanayagam A, Akram AR, Chalmers JD, Hill AT. Seven-day antibiotic courses have similar efficacy to prolonged courses in severe community-acquired pneumonia--a propensity-adjusted analysis. *Clin Microbiol Infect.* 2011 Dec;17(12):1852-8. http://www.ncbi.nlm.nih.gov/pubmed/21919994