



# FIRST-LINE EMPIRICAL ANTIBIOTIC THERAPY FOR SPECIFIC CHILDHOOD INFECTIONS

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| **Other stakeholders consulted e.g. other clinical networks, departments** | **Written in consultations with specialist teams, UHS** |
| **Summary of most recent changes (if updated guideline):** | **Amended antibiotic (Ab) recommendations**  **Clarity on when to start Abs in resp tract infections** |
| **Relevant national or international Guidance eg NICE, SIGN, BTS, BSPED** | **No** |
| **Consultation document completed: see Appendix A** | **Yes** |
| **Total number of pages:** | **50** |
| **Is this document to be published in any other format?** | **Microguide** |

**Does this document replace or revise an existing document? Yes – empirical guide v2**



# Contents of guideline

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* 1. **Introduction**

The guidelines reflect local antimicrobial susceptibilities and aim to provide clear guidance about empirical antibiotic prescribing, along with drug dosing and monitoring recommendations.

* 1. **Scope**

This guideline applies to all healthcare professionals involved in the care of children. This includes prescribers of antibiotics as well as staff administering antibiotics.

* 1. **Purpose**

To allow effective and appropriate antimicrobial therapy to be started in a timely fashion when required, and stopped/switched when indicated.

1. **Implementation**

These guidelines will be uploaded to the Microguide which is used by prescribers across Wessex.

1. **Process for Monitoring Effectiveness**

Local audits of antibiotic prescribing.

CQUIN for antibiotic resistance – total Ab/taz/mero prescribing rates.

**Appendix A**

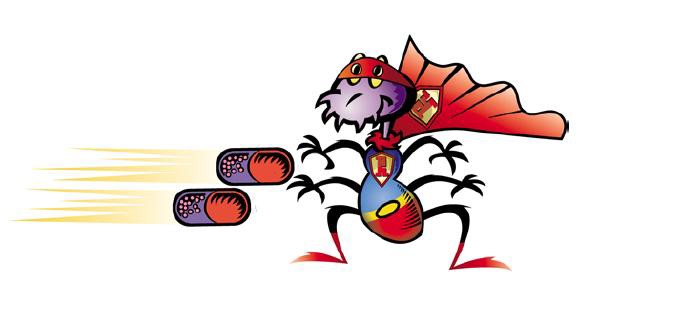
**Paediatric Regional Guideline Consultation Documentation:**

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| --- | --- | --- | --- |
| **Trust** | **Name of person consulted\* (print)** | **Designation of signatory** | **Signature** |
| Chichester |  |  |  |
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* this person agrees they have read the guidelines, consulted with relevant colleagues and members of MDT, managers and patients, young people & their families as appropriate. Any queries raised during consultation and review process should be documented with responses and any changes made to guideline.

**WESSEX FIRST-LINE EMPIRICAL ANTIBIOTIC THERAPY FOR SPECIFIC CHILDHOOD INFECTIONS**

**3rd Edition August 2017**



# For advice on children with complex infections, contact:- Southampton Paediatric Infectious Diseases team – 0782 441 7993

**IMPORTANT**

**All drug doses are based on normal renal function. For dosing in renal impairment, contact the ward pharmacist.**

**Typical durations are for uncomplicated infections. Patients with abscesses, infected prosthetic material or co-morbidity may require longer courses or surgical intervention. Choice of empirical antibiotic therapy should be reviewed in children known to be colonised with resistant organisms or at risk of an infection with a resistant organism – discuss with microbiology team.**

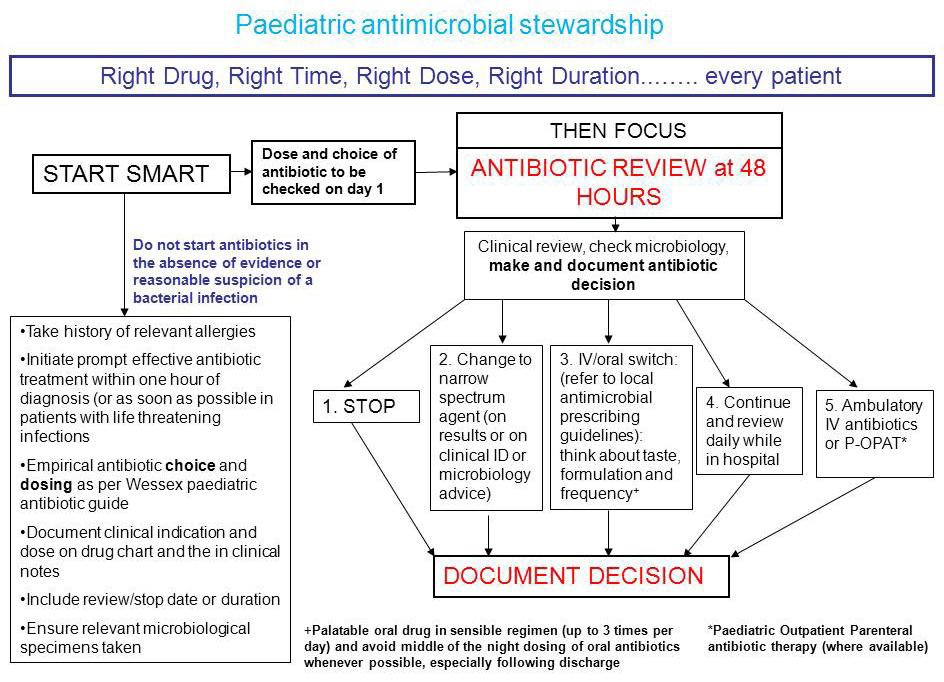
**Empirical antibiotic choice may subsequently be amended on the basis of microbiology results and progress of patient.**

**Web-based guidelines available at** <http://cms.horizonsp.co.uk/viewer/uhsft/paed>

**Microguide app available at** <http://www.microguide.eu/>

**Reviewed by the Wessex Infectious diseases & Immunology network July 2017**

# Principles of antibiotic prescribing and stewardship: START SMART – THEN FOCUS



**Principles of IV-to-oral switch therapy (IVOST)**

Switch to oral antimicrobial agents should be considered for patients who meet the following criteria:-

* + Clinical condition of the patient is improving and haemodynamically stable.
  + Afebrile for > 24 hours (temperature < 38°C).
  + Trend towards normalisation of CRP.
  + Able to tolerate oral medication and appropriate oral antimicrobial available.
  + Functioning gastrointestinal tract without risk of malabsorption.
  + No serious infections that requires IV antibiotics for total course, such as meningitis, endocarditis, exacerbations of cystic fibrosis.
  + Palatability of oral suspensions needs to be considered – oral flucloxacillin, benzylpenicillin and clindamycin are unpleasant in taste. Frequency of oral dosing can also impact on adherence with treatment – avoid 4 times per day dosing where possible.

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| **GENERALISED SEPSIS** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **ALL SEPSIS**  **Community and hospital acquired**  **(if identifiable source, please consult appropriate section)** | *Strep. pneumoniae Neisseria meningitidis Staph. aureus*  *Rarely H. influenza type b, Enterobacteriaceae & Salmonella spp*  HSV should be considered in the differential diagnosis of septic infants younger than 6 weeks. Consider sending eye, rectal and throat swabs, blood and CSF for HSV PCR. Start empirical **aciclovir IV** if vesicular rash, haemodynamically unstable, abnormal clotting/LFTs or CSF pleocytosis.  If child known to be colonised with resistant organisms or high risk of resistance, discuss with microbiology team. Choice of empirical treatment should reflect this. This is especially relevant in children with hospital acquired sepsis (deterioration >5 days after admission), If haemodynamically unstable, low threshold for adding **gentamicin**.  *RECOMMENDED BLOOD CULTURE VOLUMES >0.5ml <1*  *month, >1ml 1-36 months and 4ml≥37 months* | **<1 month age (if on NICU, see neonatal guidelines): cefotaxime IV**  **+ amoxicillin IV** (to cover Listeria). **Consider ceftriaxone instead of cefotaxime if ≥37 weeks gestation and not jaundiced.**  Stop **amoxicillin** once *Listeria* meningitis excluded by normal CSF microscopy and negative blood and CSF cultures at 48 hours.  Age > 1 month:  **ceftriaxone**  **[chloramphenicol if severe penicillin allergy]** | Group B strep=7 days *Neisseria meningitidis* =5 days *Strep. pneumoniae* =7 days *Staph. aureus* = 14 days  Gram -ve organisms =10 days (non- typhoidal *Salmonella* 7 days)  For culture -ve sepsis, 5 days minimum.  Stop Abs after 48 hours if bacterial infection excluded. |
| **Presumed central venous line infection** | Coagulase negative staphylococcus  *Staph. aureus*  Gram negative bacteria (*E. coli,* | **Vancomycin** and **gentamicin (teicoplanin instead of vancomycin in Portsmouth and HHFT). Request Etest on all clinically significant CONS isolates. Can switch to**  **teicoplanin if teicoplanin sensitive CONS on Etest.** | Duration depends whether line removed, organism isolated – to discuss with microbiology/ID team. |

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|  | *Klebsiella, Pseudomonas*) Rarely *Candida*  Note: check previous microbiology for evidence of resistant organisms. | **If suspected sepsis in a child on TPN, see gastro section For neonatal central line infection, see neonatal section**  For information on line locks, see p15 of [PIER oncology](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf) [guidelines.](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf)  Locks should be fully withdrawn before using the line. Measuring teicoplanin levels is not usually required for treatment of line infections. | If CONS in neonates, line removed and cultures cleared: consider stopping Abs 48 hours after line removal. If line removal not required, 7days Ab course required for uncomplicated CONS line infection.  CVC removal if blood cultures remain positive despite 72h of appropriate Abs. *Staph. aureus*, *Pseudomonas aeruginosa*,  *Candida* and atypical mycobacteria are  unlikely to be successfully cleared from CVC – low threshold for line removal. Remove line urgently if haemodynamic  instability persisting despite appropriate  IVAbs. |

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| **NEONATAL GUIDELINES** | | | |
| **Patient group** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Early onset sepsis (<72 hours of age) for babies on NICU** | Group B streptococcus  *E. coli*  Rarely *Listeria monocytogenes* | **Cefotaxime IV (add amoxicillin if features suggestive of Listeria)**  **OR**  **benzylpenicillin IV and gentamicin IV (NICE recommendation)** | **Gp B strep=7 days Gram -ve=10 day MSSA=14 days**  **Enterococcus=10 days (14 days if multiple positive blood cultures)**  **Culture negative sepsis = 5 days. If bacterial infection unlikely, stop antibiotics after 36-48 hours.**  **Longer duration if meningitis (see below)** |
| **Late onset sepsis (≥72 hours of age) for babies on NICU** | Coagulase negative staphylococcus  *Staph. aureus*  Gram negative organisms Consider fungal infections such as *Candida*  HSV should be considered in the differential diagnosis of septic infants younger than 6 weeks. Consider sending eye, rectal and throat swabs, blood (EDTA) and CSF for HSV PCR. Start empirical **aciclovir IV** (high dose for age) if vesicular rash, haemodynamically unstable, abnormal clotting/LFTs or CSF pleocytosis. | **Flucloxacillin IV** and **gentamicin IV.**  **If *Listeria* suspected, add amoxicillin.**  **If central line in situ, for vancomycin** and **gentamicin IV (teicoplanin instead of vancomycin in Portsmouth and HHFT). Request Etest on all clinically significant CONS isolates. Switch to vancomycin if teicoplanin resistant infection.**  Consider empirical antifungal therapy based on previous microbiology and discuss with microbiology/ID team. | **Gp B strep=7 days Gram -ve=10 days MSSA=14 days Enterococcus=10 days**  **Culture negative sepsis 5 days. If bacterial infection unlikely, stop antibiotics after 36-48 hours.**  **Longer duration if meningitis (see below)** |
| **Neonatal meningitis** | Group B streptococcus  Gram negative organisms including  *E. coli*  Uncommon: *Listeria monocytogenes*  (very rare beyond 1 month of age) | **Cefotaxime IV**  **If Listeria suspected, add amoxicillin** | Duration of Ab course:-  Group B streptococcus: ≥ 14 days  *E. coli: 21 days*  *Listeria*: 14-21 days (amoxicillin + gentamicin, stop gentamicin after 7 days) |

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| **Presumed central line infection** | Coagulase negative staphylococcus  *Staph. aureus*  Gram negative organisms Rarely fungal infections such as *Candida* | **Vancomycin IV** and **gentamicin IV (teicoplanin used empirically in Portsmouth and HHFT). Request Etest on all clinically significant CONS isolates. Switch to vancomycin if teicoplanin resistant infection.**  Monitor renal function and antibiotic levels (gentamicin).  For information on line locks, see p15 of [PIER oncology](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf) [guidelines.](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf)  Locks should be fully withdrawn before using the line. | Duration depends on whether line removed, organism isolated – to discuss with microbiology/ID team.  If CONS in neonates, line removed and cultures cleared: consider stopping Abs 48 hours after line removal  CVC removal if blood cultures remain positive despite 72h of appropriate Abs.  *Staph. aureus*, *Pseudomonas aeruginosa*, *Candida* and atypical mycobacteria are unlikely to be successfully cleared from CVC – low threshold for line removal.  Remove line urgently if haemodynamic instability persisting despite appropriate IVAbs. |
| **Periumbilical cellulitis** | *Staph. aureus* | **Flucloxacillin IV. Consider ceftriaxone IV if ≥37 weeks gestation and not jaundiced.** | 48 hours and review re IV to oral switch (total 5 days and stop unless clinically deteriorating) |
| **Ophthalmia neonatorum** | *N. gonorrhoeae Chlamydia trachomatis Staph. aureus*  Consider HSV if vesicular lesions | *N. gonorrhoeae:* **ceftriaxone IV/IM 50mg/kg single dose (max 125mg), gentamicin 0.3% eye drops** topically 4 times per day and saline eye irrigation until discharge has resolved.  **erythromycin PO** for 14 days if Chlamydia conjunctivitis. | Ophthalmia neonatorum does not refer to a simple “sticky eye” in a neonate. A sticky eye will resolve without the use of antimicrobials |
| **Necrotising enterocolitis** | Gram negatives (including *enterobacteriaceae* and *Pseudomonas aeruginosa*) *Enterococcus*  Anaerobes | **Amoxicillin IV, gentamicin IV** and **metronidazole IV.**  If central line in situ, consider **vancomycin IV, gentamicin IV** and **metronidazole IV (teicoplanin used empirically in Portsmouth and HHFT).**  If overwhelming sepsis or bowel perforation, consider **piperacillin/tazobactam, gentamicin IV** and **metronidazole IV** (+- **vancomycin IV** if central line in situ).  If CNS infection likely, use **meropenem** instead of  **piperacillin/tazobactam** and **metronidazole**. | 7-10 days (longer duration if lack of clinical improvement)  Discontinue Abs after 2-3 days if NEC thought unlikely |

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| **CENTRAL NERVOUS SYSTEM** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Meningitis** | 95% beyond 3 months of age caused by:   * *Neisseria meningitidis* * *Strep. pneumoniae* * *H. influenzae type B (unvaccinated)*   *Consider TB*  Travel history:  **Important** if possible exposure to penicillin-resistant pneumococcus (Southern or Eastern Europe & USA)  Note: enterovirus meningitis often associated with neutrophil predominance in CSF  Normal ranges for CSF:-  **Age <1month: WCC≤20, protein**  **<1150 mg/L, CSF glucose > 60% blood glucose**  **Age ≥1 month: WCC≤5, protein**  **<450 mg/L, CSF glucose > 60% blood glucose**  Take adequate volume of CSF to ensure all requested tests can be processed. Safe recommended CSF volumes:-  **<5 years 2ml**  **>5 years 4ml** | **<1 month of age: cefotaxime IV + amoxicillin IV** (to cover Listeria)  **Consider ceftriaxone if ≥37 weeks gestation and not jaundiced.**  Stop **amoxicillin** once *Listeria* meningitis excluded by negative blood and CSF cultures at 48 hours.  If < 6 weeks of age, consider **aciclovir IV** (high dose for age) for treatment of neonatal HSV.  **>1 month of age: ceftriaxone (2nd dose of ceftriaxone can be given between 12-24 hours following the first dose, for ease of administration)**  Add **oral** or **IV rifampicin** if relevant travel history  **[chloramphenicol if severe penicillin allergy]**  Start dexamethasone 150 microgram/kg IV 6-hourly for 4 days if suspected bacterial meningitis. Indicators include turbid CSF, CSF WCC>1000, raised CSF WCC and CSF protein >1000 mg/L, or positive Gram stain. Dexamethasone is not indicated in children < 3 months of age. Ideally start dexamethasone before antibiotics, but can be given at the same time or added later.  Do not start dexamethasone more than 12 hours after starting antibiotics. | *Neisseria meningitidis*: 7 days  *H. influenzae*: 10 days  *Strep. pneumoniae*: 14 days Group B streptococcus: ≥ 14 days  *E. coli: 21 days*  *Listeria*: 14-21 days (amoxicillin + gentamicin, stop gentamicin after 7 days) |

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| **Encephalitis/ Meningo- encephalitis** | For list of bacterial pathogens see meningitis section  Commonly viral causes include: HSV, enteroviruses, EBV, VZV, CMV, measles, mumps. Less  common viruses include arboviruses,  haemorrhagic fever, rabies.  Other considerations: *Mycoplasma pneumoniae* Consider TB and Lyme  **Travel history important**  Take adequate volume of CSF to ensure all requested tests can be processed. Safe recommended CSF volumes:-  **<5 years 2ml**  **>5 years 4ml**  Send CSF for HSV, VZV and enterovirus PCR and stool/rectal  swab, blood (EDTA) and throat swab for enterovirus PCR. | **<1 months age: cefotaxime IV + amoxicillin IV** (to cover Listeria) **+ aciclovir IV** (high dose for age). **Consider ceftriaxone if ≥37 weeks gestation and not jaundiced.**  Stop **amoxicillin** once *Listeria* meningitis excluded by negative blood and CSF cultures at 48 hours.  **>1 month of age: ceftriaxone**  **+ aciclovir IV**  Do not start **aciclovir** in the following cases:  -children with simple febrile convulsion who recover fully  -Seizures without documented fever or Hx of fever (unless immunocompromised)  -Other obvious cause for symptoms ie blocked shunt  -If CSF and clinical picture highly suggestive of bacterial meningitis  Only add empirical mycoplasma treatment if patient presents with respiratory symptoms (po **azithromycin** / IV **clarithromycin** if age <8 years, **doxycycline po** if age≥8 years)  Low threshold for empirical oseltamivir in influenza A season (can stop if resp viral PCRs negative)  **[chloramphenicol if severe penicillin allergy]** | Dependent on aetiology. Prolonged treatment often indicated.  **Aciclovir** – 14 days minimum for HSV encephalitis (21 days in immunocompromised patients).  If neonatal HSV with CNS involvement, for 21 days **aciclovir** minimum.  Repeat CSF PCR prior to stopping Tx – if positive, for further week of Tx and then repeat CSF PCR prior to stopping Tx. |
| **Brain abscess/ subdural empyema** | *Strep. milleri group*  *H. influenza type b*  Anaerobes  Mixed infection common  *Staph. aureus* if history of trauma or surgery  *Nocardia* and fungal infections  *(Aspergillus)* in immunocompromised patients | **<1 month of age: cefotaxime IV, metronidazole IV + amoxicillin IV** (to cover Listeria). **Consider ceftriaxone if**  **≥37 weeks gestation and not jaundiced.**  Stop **amoxicillin** once *Listeria* meningitis excluded by negative blood and CSF cultures at 48 hours.  **>1 month: ceftriaxone IV + metronidazole (po or IV)** | 6 weeks  Discuss timing of IV to oral switch with ID team |

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| **Ventriculoperitoneal shunt infection** | Coagulase negative staphylococcus  *Staph. aureus* | **Vancomycin IV** and **ceftriaxone (cefotaxime IV** in children age <1 month if jaundiced or gestational age <37 weeks)  Shunt removal required (CoNS infection may be treated conservatively – remove shunt if CSF not sterilised)  If ventriculitis strongly suspected, add intrathecal **vancomycin** (should be used in conjunction to IV **vancomycin**) | Discuss all suspected cases with UHS neurosurgeons and local microbiologists. Uncomplicated 10 days  Complicated 21 days (ventriculitis, severe peritonitis, remaining prosthetic material) |

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| **RESPIRATORY** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Pneumonia, Community Acquired (CAP)** | *Most lower respiratory tract infections are of viral aetiology - consider bacterial pneumonia if persistent/recurrent fever over preceding 24-48 hours with chest wall recession and tachypnoea. Presence of generalised wheeze makes viral aetiology far more likely.*  *Strep. pneumoniae*  Non-typeable *H.influenzae Staph. aureus*  *Moraxella catarrhalis Mycoplasma pneumoniae Chlamydia pneumoniae Bordetella* spp  Viral (esp RSV, influenza, adenovirus)  TB | **Most children with a lower resp tract infection do not need treatment with antibiotics.** Consider the use of antibiotics if persistent/recurrent fever over preceding 24-48 hours with chest wall recession and tachypnoea. *Presence of generalised wheeze makes viral aetiology far more likely.* *[The presence of crepitations on auscultation are poor at differentiating bacterial and viral LRTIs in children](https://www.researchgate.net/publication/13779446_The_rational_clinical_examination_Does_this_infant_have_pneumonia).*  **If moderate:**  **amoxicillin PO** (or **co-amoxiclav PO** if no response to  **amoxicillin**)  **If severe or complicated pneumonia** (O2 sats<85%, haemodynamic instability/septicaemia, immunocompromised, chronic lung disease, congenital heart disease, empyema, necrotising pneumonia):  < 1 month of age treat with **cefotaxime IV**. Consider  **ceftriaxone IV** if ≥37 weeks gestation and not jaundiced.  1-3 months of age: **ceftriaxone IV**  ≥3 months of age: **amoxicillin** **IV**. If IV access issues or option for ambulation (and oral switch not appropriate), consider **ceftriaxone IV**  **If hospital acquired pneumonia** (deterioration >5 days since admission), consider **piperacillin/tazobactam tazocin)** due to risk of resistant organism.  Consider **azithromycin** for pertussis or *Chlamydia* if under 4 months or unimmunised  Treatment for atypical infections should only be considered in severe infection if no response to first line empirical therapy- use **azithromycin PO**  (or **clarithromycin IV**) | Dependent on organism. Usually 5-7 days.  **Aim for early IV to oral switch** (oral antibiotics are safe and effective for children even with severe CAP) unless unable to tolerate oral Abs or signs of septicaemia or complex pneumonia (empyema or necrotising pneumonia) -  - oral switch option is **amoxicillin** 40mg/kg bd (max 1g bd) **[azithromycin if penicillin allergy]**  Provide safety netting information (verbal and written) prior to discharge. |

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| **Influenza** | Children with risk factors should be treated with antivirals (as per PHE guidance) if admitted to hospital with confirmed or presumed influenza infection (during periods that influenza is known to be circulating locally).  Only treat children without risk factors who are admitted to PHDU / PICU with confirmed or presumed influenza infection.  For [full guideline, see PIER website.](http://www.piernetwork.org/uploads/4/7/8/1/47810883/pier-regional-guideline-governance-influenza__3___1_.pdf) | **Oseltamivir (**the choice of antiviral agent in severely immunocompromised patients depends on the predominant circulating strain ie H3N2 versus H1N1 (higher risk of oseltamivir resistance with H1N1).  Where indicated, treatment should be initiated as soon as possible (ideally within the first 48 hours of symptoms). | 5 days |
| **Ventilator associated pneumonia**  **(for patients on NICU, see neonatal section)** | Community acquired organisms most likely if early-onset VAP (See above) *Enterobacter cloacae, Pseudomonas*  *aeruginosa, Acinetobacter* species*,*  *Stenotrophomonas maltophilia Staph. aureus* (including MRSA) | **If <5 days since admission, ceftriaxone IV**. If already on **ceftriaxone** at the time of respiratory deterioration, switch to **piperacillin/tazobactam IV.**  **If >5 days since admission, piperacillin/tazobactam IV.** | Review with BAL results.  If confirmed VAP, 5-7 days. If non-lactose fermenting Gram -ve (*Pseudomonas spp.,* Acinetobacter), minimum 10 day course.  If VAP unlikely, stop Abs after 48 hours. |
| **Pleural empyema** | *Strep. pneumoniae Staph. aureus*  Non-typeable *H. influenzae* | **Ceftriaxone IV.**  Add **clindamycin** if any evidence of toxin mediated disease (haemodynamic instability, mucosal erythema, rash, diarrhoea etc). | Usually 2 weeks minimum. Consider IV to oral switch (**co-amoxiclav**) once fever resolving and CRP normalising.  [**azithromycin PO** if penicillin allergy] |

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| **GASTROINTESTINAL** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Bloody diarrhoea AND septic** | Non-typhoidal *Salmonella Shigella*  *E. coli Campylobacter* | **Ceftriaxone IV**  If haemolytic uraemic syndrome suspected, please discuss with infection team. Stop Abs if HUS and verotoxin producing E Coli | 5 days |
| **Enteric fever/typhoid bacteraemia** | *Salmonella typhi Salmonella paratyphi* | **Ceftriaxone IV.**  If asymptomatic or uncomplicated diarrhoea with no bacteraemia, antibiotic treatment is not indicated. | 10 days (although evidence to support shorter course length in s. Paratyphi infections) - 7 days  Usual minimum IVAbs 5 days, then consider oral switch to **ciprofloxacin**. If **ciprofloxacin** resistant, for oral **azithromycin** (3 consecutive days). |
| **Community acquired peritonitis** | Gram negative organisms such as *E. coli*  Anaerobes | **Ceftriaxone IV and metronidazole IV/PO** | 5 days |
| ***Clostridium difficile* associated diarrhoea** | Children under 2 years of age should not be routinely tested for *C. difficile.*  High risk patients under 2 years of age (oncology, primary immunodeficiency) require discussion with paeds ID or microbiology team before testing or treatment.  *Diagnosis involves a 2 step process: step 1=screening with GDH. If GDH*  *+ve, testing performed for C. difficile* toxin (EIA) +- PCR – if either EIA or PCR positive, *suggests patient carrying C. difficile* which is  potentially the cause of diarrhoea | **Non-severe** - **metronidazole PO** tds (iv if nil-by-mouth) for 10 days (switch to **vancomycin PO** if no response after 6 days)  **Severe but no ileus or colonic dilatation** - **vancomycin PO** qds 10-14 days + consider gastroenterology r/v  **Severe with ileus or colonic dilatation** - **metronidazole IV** tds + **vancomycin** via NG tube qds for 10-14 days + gastroenterology or surgical r/v  If refractory C. diff despite 2 antibiotic courses, and no other cause of ongoing diarrhoea, consider faecal transplantation (discuss with Portsmouth microbiology team) | 10-14 days |

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| **Sepsis / bacterial translocation / in children on TPN** | Gram-positives (including MRSA, coagulase-negative Staph and enterococci)  Gram-negatives (including enterobacteriaceae and *Pseudomonas aeruginosa*)  Anaerobes  Fungal infections such as *Candida* | **All children on long term TPN with a presumed line infection should be discussed with UHS gastro team within 24 hours of admission. They should all have an individualized antibiotic plan for initial treatment.**  **Assess previous microbiology results and adjust empirical antibiotic choice to reflect known resistance.**  **vancomycin IV**  **+ gentamicin IV once daily**  **+- metronidazole IV**  Line locks are not a substitute for systemic Ab therapy.  Consider adding **piperacillin/tazobactam IV** if likely pseudomonas infection or severe sepsis. Consider empirical caspofungin if severe sepsis (discuss with paeds ID or micro team).  For information on line locks, see p15 of [PIER oncology](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf) [guidelines.](http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-full-text.pdf) Locks should be fully withdrawn before using the line. | TPN should not be stopped unless the patient is haemodynamically unstable. Consultant decision to restart TPN.  Staph aureus, pseudomonas aeruginosa, Candida and atypical mycobacteria are unlikely to be successfully cleared from CVC – low threshold forline removal.  Remove line urgently if persisting haemodynamic instability despite appropriate IVAbs. Consider removal of line if blood cultures remain positive despite 72h of appropriate Abs.  Duration of Ab therapy depends whether line removed / organism isolated – to discuss with microbiology/ID team. |
| **Exacerbation of inflammatory bowel disease** | Gram-negatives (including enterobacteriaceae and *Pseudomonas aeruginosa*)  Enterococcus Anaerobes | **Ciprofloxacin IV and metronidazole**  Decision to start Abs must be made by gastro consultant- Abs are usually only considered in children with rectal disease or in those in whom surgery is likely. |  |

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| **SKIN AND SOFT TISSUE** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice [acceptable alternative]** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Cellulitis** | *Staph. aureus*  Group A streptococcus Group G streptococcus  Consider α-haemolytic streptococci or anaerobes if facial cellulitis  If recurrent or severe *Staph aureus*  infection, consider PVL testing. | **If mild/moderate infection, oral cefalexin** or **oral co- amoxiclav. [Clarithromycin if confirmed penicillin allergy]**  **If severe infection:-**  **ceftriaxone IV** [if severe penicillin allergy, use **clindamycin**]  Add **metronidazole** if facial cellulitis (see ophthalmology section for periorbital cellulitis)  Add **clindamycin** if associated sepsis / signs of toxin mediated disease (risk factors include chickenpox or burns). Consider IVIG 2g/kg. | 7 days  (may have oral switch)  Consider ambulation and daily review on  **ceftriaxone** IV (+- **metronidazole** po)  **Oral**  **Cefalexin or co-amoxiclav**  or **[Clarithromycin if penicillin allergy]**  or **co-amoxiclav for facial cellulitis**  Provide safety netting information (verbal and written) prior to discharge. |
| **Impetigo** | *Staph. aureus*  Group A streptococcus | If mild/moderate infection, use **oral cefalexin or co- amoxiclav**  **[clarithromycin if confirmed penicillin allergy]**  **If severe infection, use ceftriaxone IV** [if severe penicillin allergy, use clindamycin]  [Most children with infected eczema do not benefit from](https://www.ncbi.nlm.nih.gov/pubmed/26938214) [antibiotic therapy (oral or topical) - except those with a severe](https://www.ncbi.nlm.nih.gov/pubmed/26938214) [infection.](https://www.ncbi.nlm.nih.gov/pubmed/26938214) Optimisation of topical steroids is the mainstay of treatment in these patients. | 5 days  (may have oral switch)  **Oral options** – **cefalexin or co-amoxiclav**  or **[clarithromycin if penicillin allergy]** |

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| **Bites (not insect bites)** | *Staph. aureus Bacteroides spp*. *Pasteurella multocida*  Group A *streptococcus* (human bites)  Often polymicrobial (aerobic + anaerobic) | Antibiotics are not generally needed if the wound is more than 2 days old and there is no sign of local or systemic infection  Prescribe antibiotics for:   * All human bite wounds under 72 hours old. * All cat bites, animal bites to the hand, foot, and face; puncture wounds; wounds requiring surgical debridement; wounds involving joints, tendons, ligaments, or suspected fractures. * Wounds that have undergone primary closure. * Children who are at risk of serious wound infection (for example those who are asplenic, or immunosuppressed). * Children with a prosthetic valve or a prosthetic joint.   If mild/moderate injury, for oral **co-amoxiclav**.  If severe or deep penetrating, IV **co-amoxiclav** and  **clindamycin po/IV**  [**Azithromycin** and **metronidazole** if penicillin allergy] | 7 days if mild penetrating injury.  14 days if severe or deep penetrating injury  – IV antibiotics followed by oral **co- amoxiclav**.  Consider tetanus and hepatitis B vaccine if human bite. Consider tetanus immunoglobulin if animal bite in children with incomplete tetanus immunisation status. |
| **Secondary infections following burns** | *Staph. aureus*  Group A streptococcus *Pseudomonas aeruginosa Candida spp.* | Do not use topical prophylactic Abs post-burns  If mild/moderate infection, use **oral cefalexin or co- amoxiclav**  **[clarithromycin if confirmed penicillin allergy]**  **If severe infection, use ceftriaxone**  If know colonised with pseudomonas, for  **piperacillin/tacobactam** (tazocin)  If signs of systemic upset and /or diarrhoea and/or spreading rash, treat as toxic shock syndrome and add IV **clindamycin**. Consider IVIG 2g/kg (preferable to FFP as higher antitoxin  concentration) | 7 days  (may have oral switch)  Consider ambulation and daily review on  **ceftriaxone** IV  **Oral**  **cefalexin or co-amoxiclav**  or **[clarithromycin if penicillin allergy]** |

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| **Scarlet fever** | Group A streptococcus | For children unable to swallow tablets, **amoxicillin** 40mg/kg bd **PO** (max 1g per dose)for 7 days – see recent [Cochrane review](http://www.cochrane.org/CD004872/ARI_the-effect-of-short-duration-versus-standard-duration-antibiotic-therapy-for-streptococcal-throat-infection-in-children).  For children able to swallow tablets; if age 6-12 years,  **penicillin V** 500mg bd; if age >12 years, **penicillin V** 1 g bd for 7 days (see [review on frequency of penicillin dosing – bd versus qds](https://www.ncbi.nlm.nih.gov/pubmed/10654979)).  **[azithromycin PO** for 5 days for penicillin allergy]  If unable to tolerate oral antibiotics, **ceftriaxone** IV (**clindamycin** if severe penicillin allergy). | 7 days |
| **Erythema migrans** | *Borrelia burgdorferi* | <8 years of age: **amoxicillin** po 17mg/kg tds (**azithromycin** if penicillin allergy)  8 years and older – **doxycycline** 5 mg/Kg on day 1 followed by 2.5mg/kg bd (max 400 mg day 1 then 200mg/day thereafter) | 21 days |
| **Surgical site infections** | *Staph. aureus*  Gram -ve organisms less common unless known to be previously colonised. | Not all infections require treatment with antibiotics; minor infections may respond to drainage of pus (for  example, by removal of sutures) and topical antiseptic agents Deep seated infections may need surgical debridement and prosthetic material should be removed where possible.  If systemic antibiotic treatment required, use **flucloxacillin**  **IV.** If risk of contamination with faecal flora (post GI surgery), use **co-amoxiclav** IV.  Use **vancomicin** IV if known MRSA colonised or severe penicillin allergy. Vancomycin and gentamicin if risk of contamination with faecal flora (post GI surgery) and severe penicillin allergy.  If no improvement, switch to **vancomicin and ciprofloxacin IV** and consider if source control is required. | 5-7 days  (longer courses may be required for deep surgical site infections. Very long courses may be required if prosthetic material *in situ*)  Consider IV to oral switch using **cefalexin or co-amoxiclav**. |
| **MRSA**  **decolonisation** |  | Patients found to be newly MRSA positive should commence a topical decolonisation regimen of nasal mupirocin and octenisan / chlorhexidine body washes for 5 days, including hair washing on days 2 and 4 (see local MRSA policy for further guidance). |  |

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| **BONE AND JOINT INFECTIONS** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Osteomyelitis or septic arthritis** | *Staph. aureus Strep. pneumoniae*  Group A streptococcus  *H. influenzae Kingella kingae*  Consider TB  *Salmonella in* Sickle cell | **< 1 month of age** treat with **cefotaxime IV**. **Consider ceftriaxone if ≥37 weeks gestation and not jaundiced.** Children under 1 month of age with serious bacterial infection require a LP unless contraindicated.  **>1month- 5 years ceftriaxone IV**.  >=6 years **flucloxacillin** 50 mg/kg/qds IV (maximum 2g/dose)  **(clindamycin IV if penicillin allergy)** | Duration guided by clinical signs and CRP. Usual: 4-6 wks  Septic arthritis: 2-3 wks  Consider IV to oral switch when improvement in pain, resolution of fever and CRP<20mg/L or <1/3 of highest CRP  **Oral options include cefalexin or co-amoxiclav**  or **[clarithromycin if penicillin allergy]** |

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| **URINARY TRACT / RENAL INFECTIONS** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice [acceptable alternative]** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Lower UTI (cystitis)** | *E. coli Klebsiella spp. Proteus spp.*  *Staph. saprophyticus*  Urine collection in infants – [Kaufmann et al BMJ open](http://bmjopen.bmj.com/content/bmjopen/6/8/e011357.full.pdf) | If febrile, assume upper renal tract infection / pyelonephritis and treat with 10 day antibiotic course (See pyelonephritis section)  **<3 months of age** : treat as pyelonephritis (see below)  **>3 months of age: trimethoprim PO**  If previous treatment with trimethoprim in preceding 3 months, use **nitrofurantoin PO** (if able to swallow tablets) or use **cefalexin PO**  [**ciprofloxacin PO** if severe penicillin allergy]  If multidrug resistant gram -ve organism, discuss with microbiology. | 3 days  (advise parents to seek reassessment if still unwell after 24-48 hrs or if child becomes febrile)  ANTIBIOTIC PROPHYLAXIS: **only use**  routinely in children below 1 year of age with evidence of dilating reflux.  consider in girls >1 year with dilating reflux, as reduces the number of febrile urinary infections but no reduction in renal scarring.  Do not use in:   * children with non-dilating reflux * boys >1 year with dilating reflux.   Note: use of prophylactic Abs increases rate of resistant organisms. |

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| **Pyelonephritis/ upper UTI or UTI with septicaemia** | As above +  *Pseudomonas aeruginosa*  Urine collection in infants – [Kaufmann et al BMJ open](http://bmjopen.bmj.com/content/bmjopen/6/8/e011357.full.pdf) | All children with a febrile UTI should be considered to have pyelonephritis / upper renal tract infection.  There is no evidence to suggest that children with pyelonephritis (without bacteraemia) initially treated with IVAbs have improved outcomes compared to those treated with oral Abs alone. Empirical IVAb treatment is required in children:   * under 3 months of age * unable to tolerate oral Abs * systemically unwell (suggestive of bacteraemia)   **<1 month of age: cefotaxime IV. Consider ceftriaxone if**  **≥37 weeks gestation and not jaundiced.** Single dose **gentamicin** if haemodynamically unstable. Children under 1 month of age with serious bacterial infection require a LP unless contraindicated.  **1 – 3 months of age: ceftriaxone IV.** Stat **gentamicin IV** if haemodynamically unstable.  Consider adding **gentamicin** if previous renal pathology or recurrent UTIs.  **>3 months of age:**  **Treat empirically with oral cefalexin PO (or ciprofloxacin PO if severe penicillin allergy) unless unable to tolerate oral Abs or systemically unwell (suggestive of bacteraemia). If so, treat with intravenous antibiotics: ceftriaxone IV.** Add stat **gentamicin IV** if haemodynamically unstable. Consider adding **gentamicin** if previous renal pathology or recurrent UTIs.  [**Piperacillin/tazobactam IV** monotherapy if **gentamicin**  contra-indicated]  [**ciprofloxacin** +- **gentamicin** if severe penicillin allergy]  If known to be colonised with multidrug resistant gram -ve organism, discuss with microbiology. | Duration dependent on clinical response, usual minimum 7 days for pyelonephritis (if associated bacteraemia, minimum duration 10 days).  Choice of oral switch agent based on antibiotic sensitivities. Commonly used agents include **trimethoprim** and **cefalexin** (nitrofurantoin penetrates renal tissue poorly and should not generally be used for the treatment of upper UTIs**)**  ANTIBIOTIC PROPHYLAXIS  **only use** routinely in children below 1 year of age with evidence of dilating reflux.  Consider in girls >1 year with dilating reflux, as reduces the number of febrile urinary infections but no reduction in renal scarring.  Do not use in:   * children with non-dilating reflux * boys >1 year with dilating reflux.   Note: use of prophylactic Abs increases rate of resistant organisms. |

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| **Peritoneal-dialysis associated peritonitis** | Coagulase negative staphlylococcus  *Staph. aureus Enterococcus*  Gram negative organisms including *E coli, Klebsiella* and *Pseudomonas spp.*  Consider fungal infection | **Vancomycin** and **ciprofloxacin** added to dialysis fluid | 14 days |

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| **CARDIOVASCULAR** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Infective endocarditis** | *Strep. viridans Staph. aureus Enterococci*  Coagulase negative staphylococcus | **Benzylpenicillin IV** and **gentamicin IV** (**gentamicin** as per endocarditis dosing regimen – 2.5mg/kg 8 hourly if >1 month of age).  If suspected *Staph. aureus* or septic shock, **flucloxacillin IV** and **gentamicin IV** (**gentamicin** as per endocarditis dosing regimen – 2.5mg/kg 8 hourly if >1 month of age)  If prosthetic material in situ, likely coagulase negative *staphylococci* or MRSA, or penicillin allergy, use **vancomycin IV, rifampicin (IV initially)** and **gentamicin IV.** | Duration depends on organism. Discuss with infection team.  Stop gentamicin after 7 days.  Send minimum 3 blood cultures prior to commencing antibiotics  For persistent positive blood culture despite appropriate antibiotics, discuss with microbiology/ID team. |
| **Children on ECMO** | *Staph. aureus*  Coagulase negative staphylococcus Gram negative organisms including *E coli, Klebsiella* and *Pseudomonas* spp. | **Neck cannulation without open chest**: stat dose of **vancomycin IV** and **gentamicin IV** at the time of cannulation and decannulation.  **Open chest cannulation: vancomycin IV** and **gentamicin IV** for 48 – 72 hrs (depending on ongoing need for recurrent chest re-exploration). Further stat dose of **vancomycin IV** and **gentamicin IV** prior to decannulation if off Abs.  **Deterioration on ECMO: vancomycin IV**, **gentamicin IV**  and **piperacillin/tazobactam IV**. | Monitor renal function and antibiotic levels. |

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| **SURGICAL** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Appendicitis** | Gram negative organisms including  *E. coli, Klebsiella* and *Pseudomonas.*  Anaerobes | If simple appendicitis, single pre-op dose **ceftriaxone IV** and  **metronidazole IV; or co-amoxiclav**  For treatment of presumed perforated appendicitis or appendix mass:-  **ceftriaxone IV** and **metronidazole (IV initially); or co- amoxiclav.**  [**Metronidazole IV, teicoplanin IV** and **gentamicin IV** if severe penicillin allergy]  If clinical deterioration post-op, consider **piperacillin/tazobactam IV, metronidazole (IV initially)** and **gentamicin IV**. | If perforated appendicitis, minimum 5 days. IV to oral switch (**co-amoxiclav** if apyrexial day 3)  If possible leak, start treatment as for perforated appendicitis and review with cultures at 48 hours. |
| **Surgical site infections** | *Staph. aureus*  Gram -ve organisms less common unless known to be previously colonised. | Not all infections require treatment with antibiotics. Minor infections may respond to drainage of pus (for  example, by removal of sutures) and topical antiseptic agents Deep seated infections may need surgical debridement and prosthetic material should be removed where possible.  If systemic antibiotic treatment required, use **flucloxacillin**  **IV.** If risk of contamination with faecal flora (post GI surgery), use **co-amoxiclav** IV.  Use **vancomicin** IV if known MRSA colonised or severe penicillin allergy. Vancomycin and gentamycin if risk of contamination with faecal flora (post GI surgery) and severe penicillin allergy.  If no improvement, switch to **vancomicin and ciprofloxacin IV** and consider if source control is required. | 5-7 days  (longer courses may be required for deep surgical site infections. Very long courses may be required if prosthetic material in situ)  Consider IV to oral switch using **cefalexin or co-amoxiclav**. |

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| **Sternal wound infections post cardiothoracic surgery** | *Staph. aureus* | **Flucloxacillin IV**. Consider debridement, vacuum-assisted closure.  [**Clindamycin** if penicillin allergy]  If no improvement, consider switch to **vancomycin IV Vancomycin IV** empirically if known MRSA colonised. | If no debridement required, 2 weeks. If debridement, for 4 weeks.  Consider IV to oral switch:  **cefalexin**  **co-amoxiclav flucloxacillin**  **[Clarithromycin if penicillin allergy]** |
| **Necrotising enterocolitis or typhlitis** | Gram negative organisms such as *E. coli* and *Klebsiella*.  *Enterococcus Pseudomonas spp.* Anaerobes | **Amoxicillin IV, gentamicin IV** and **metronidazole IV.**  If central line in situ, consider **vancomycin IV, gentamicin IV** and **metronidazole IV (teicoplanin used empirically in Portsmouth and HHFT).** If overwhelming sepsis or bowel perforation, consider **piperacillin/tazobactam, gentamicin IV** and **metronidazole IV** (+- **vancomycin IV** if central line in situ).  If CNS infection likely, use **meropenem** instead of  **piperacillin/tazobactam** and **metronidazole**. | 7-10 days (longer duration if lack of clinical improvement)  Discontinue Abs after 2-3 days if NEC thought unlikely |

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| **OPHTHALMOLOGY** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Peri-orbital and orbital cellulitis** | As non-facial and also:  *H. influenzae (non-typeable) Strep. pneumoniae Moraxella catarrhalis*.  **Consider MRSA in all non-responders** | **Consider urgent ophthalmology review: mild peri-orbital cellulitis can be managed with oral co-amoxiclav** [**azithromycin** if penicillin allergy].  **ceftriaxone IV if moderate /severe infection or if any concerns about orbital cellulitis [vancomycin and ciprofloxacin if severe penicillin allergy]**  **ADD metronidazole IV if severe infection:**   * Cannot see eye movements **or** * Eye movements are restricted or cannot be seen due to complete ptosis **or** * Condition worsens after 24 hrs therapy   **Patients with severe infection should have urgent initiation of treatment, imaging (CT) and referral to ENT and ophthalmology.** Imaging is **not** required for non-severe infection. | 10 days  May have oral switch to:  **co-amoxiclav**  [**Azithromycin** if penicillin allergy]  Provide safety netting information (verbal and written) prior to discharge. |
| **Ophthalmia neonatorum** | *N. gonorrhoeae Chlamydia trachomatis Staph. aureus*  Consider HSV if vesicular lesions | *N. gonorrhoeae:* **Ceftriaxone IV/IM 50mg/kg single dose (max 125mg), gentamicin 0.3% eye drops** topically 4 times per day and saline eye irrigation until discharge has resolved.  **erythromycin PO** for 14 days if Chlamydia conjunctivitis. | Ophthalmia neonatorum does not refer to a simple “sticky eye” in a neonate. A sticky eye will resolve without the use of antimicrobials |
| **Conjunctivitis** | Viral cause most likely (adenovirus, enterovirus, occasionally herpes simplex)  *Staph. aureus*  *H. influenzae (non-typeable) Strep. pneumoniae* | Usually no treatment required  **Consider chloramphenicol eye drops and chloramphenicol ointment 1%** | Continue until 2 days after symptoms resolved |

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| **ENT** | | | |
| **INFECTION** | **Most likely causal organisms** | **First choice** | **Ongoing management / MINIMUM duration of antibiotic therapy** |
| **Tonsillitis** | Most young children presenting with tonsillitis have a viral aetiology.  Group A streptococcus  Consider testing for EBV (EBV serology) | **Base decision to treat on** [FeverPAIN score](https://ctu1.phc.ox.ac.uk/feverpain/index.php) ( 1 point for each of Fever, Purulence, Attend within 3 days of onset or less, severely Inflamed tonsils, No cough or coryza):   * score 0-1 = 18% streptococci: use NO antibiotics * score 2-3: 34-40% streptococci, use back up/delayed antibiotic * score ≥4: 62-65% streptococci, use immediate Ab. Based on [Little P et al, BMJ 2013](http://www.bmj.com/content/347/bmj.f5806)   Score validated in children 3 years and over – younger children are **less likely** to have a bacterial aetiology and are **less likely** to develop complications.  No significant difference in pain score at day 3 in children treated with antibiotics compared to those treated with placebo ([Cochrane review 2013](http://www.cochrane.org/CD000023/ARI_antibiotics-people-sore-throats)). Need to treat >4000 children with antibiotics to prevent one case of quinsy.  Most children with tonsillitis do not require a throat swab.  For children unable to swallow tablets; **amoxicillin** 40mg/kg bd **PO (**max 1g per dose)for 7 days (2012 [Cochrane review](http://www.cochrane.org/CD004872/ARI_the-effect-of-short-duration-versus-standard-duration-antibiotic-therapy-for-streptococcal-throat-infection-in-children)).  [The use of amoxicillin does not significantly increase the risk](http://adc.bmj.com/content/101/5/500) [of rash in acute EBV.](http://adc.bmj.com/content/101/5/500)  For children able to swallow tablets; if age 6-12 years,  **penicillin V** 500mg bd; if age >12 years, **penicillin V** 1 g bd for 7 days (see [review on frequency of penicillin dosing – bd versus qds](https://www.ncbi.nlm.nih.gov/pubmed/10654979)).  **[azithromycin PO** for 5 days for penicillin allergy]  If unable to tolerate oral antibiotics, **ceftriaxone** IV (**clindamycin** if severe penicillin allergy). | 7 days  Provide safety netting information (verbal and written) when a watchful waiting approach is taken and when antibiotics are prescribed.  Consider a delayed prescribing approach. Consider oral switch to **amoxicillin**  If confirmed EBV, stop Abs |
| **Peritonsillar abscess (quinsy)** | Group A streptococcus Anaerobes | **Ceftriaxone IV + metronidazole IV / PO** | 10 days  Consider oral switch to **co-amoxiclav** |

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| **Acute otitis media** | *Strep. pneumoniae*  Non-typeable *H.influenzae Moraxella catarrhalis* | AOM resolves in 60% by 24 hours without Abs. Abs only reduce pain at 2 days (NNT 15) and does not prevent deafness. Need to treat 4800 with antibiotics to avoid 1 case of mastoiditis.  **If ear discharge but systemically well and apyrexial, treat with topical antibiotics (sofradex or neomycin) for 10 days and consider aural toilet (ENT team to perform).**  [Only consider starting oral antibiotics if any of the following](http://www.nejm.org/doi/pdf/10.1056/NEJMoa0912254) [criteria are met in a child presenting with AOM (bulging ear](http://www.nejm.org/doi/pdf/10.1056/NEJMoa0912254) [drum or discharge](http://www.nejm.org/doi/pdf/10.1056/NEJMoa0912254)):-   * Symptoms for 4 days or more * Purulent discharge from ear canal (not due to otitis externa) * Systemically unwell * Under 6 months of age with presumed acute OM. In child 6 months- 2 years old:- * Bilateral OM * Unilateral OM and symptom score of >8 (0=no symptoms, 1=a little, 2=a lot) for the following criteria:-   ∙fever (>39 degrees = score of 2)   ∙tugging ears  ∙crying more  ∙irritability  ∙difficulty sleeping  ∙less playful  ∙eating less.  **amoxicillin PO** for 5 days.  If failed treatment with amoxicillin , **co-amoxiclav PO** for 5 days  If IV treatment required, for **ceftriaxone IV**  [**azithromycin PO** for 3 days for penicillin allergy]  In children with tympanostomy tubes in situ, data suggest that treatment with topical Abs is associated with lower rates of treatment failure than Tx with oral Abs - ([Ahmed, ADC 2018](https://www.ncbi.nlm.nih.gov/pubmed/29191999)) | 5 days (3 days if **azithromycin**)  Provide safety netting information (verbal and written) when a watchful waiting approach is taken and when antibiotics are prescribed.  Consider a delayed prescribing approach. |

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| **Acute otitis externa** | *Pseudomonas spp. Staph. aureus* | Perform aural toilet (if available) and analgesia  Cure rates similar at 7 days for topical acetic acid or Ab +- steroid  First line: acetic acid  Second line: **neomycin** with corticosteroid  If cellulitis and disease extending outside ear canal, start oral Abs based on sensitivities. Empirical treatment with **oral cefalexin** or **oral co-amoxiclav**.  [**azithromycin PO** for 3 days for penicillin allergy] If severe, consider IV **ceftriaxone**. | 7 days |
| **Mastoiditis** | *Strep. pneumoniae Moraxella catarrhalis*  *H. influenzae*,  Group A streptococcus  Less common:  *Staph. aureus*  occasional anaerobes | **Ceftriaxone IV**  **+ metronidazole (PO or IV)** | Total antibiotic course 10 days:-  consider early oral switch to **co-amoxiclav**  If associated sinus venous thrombosis, will require minimum 4 week course of antibiotics  – 2 weeks IV followed by 2 weeks oral. |
| **Rhinosinusitis** | *Strep. pneumoniae*  Non-typeable *H.influenzae Moraxella catarrhalis Anaerobes* | Generally Abs are not required as 80% resolve within 14 days without Tx (NNT 15). Offer adequate analgesia.  Consider treating if most of the following are present:  • symptoms for more than 10 days  • marked deterioration after an initial milder phase  • fever  • unremitting purulent nasal discharge  **amoxicillin PO** if no previous treatment in preceding 4 weeks.  If treatment with amoxicillin in preceding 4 weeks, **co- amoxiclav po**  [**azithromycin PO** for 3 days for penicillin allergy]  **If severe**, may require initial treatment with **ceftriaxone IV**  prior to oral switch | 5 days  Provide safety netting information (verbal and written) when a watchful waiting approach is taken and when antibiotics are prescribed. |

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| **Lymphadenitis** | *Staph. aureus*  Group A streptococcus | If lymphadenopathy is bilateral, non-erythematous, non- tender, with node size less than 3 cm, and child systemically well, consider a no treatment, watchful waiting approach. Low threshold for treatment if child immunocompromised.  **If mild, cefalexin PO** or **co-amoxiclav PO If severe, ceftriaxone IV.**  [**azithromycin** if penicillin allergy] | 7 days  May have oral switch to **cefalexin PO** or **co- amoxiclav PO**  Provide safety netting information (verbal and written) when a watchful waiting approach is taken and when antibiotics are prescribed. |
| **Peri-orbital and orbital cellulitis** | As non-facial and also:  *H. influenzae (non-typeable) Strep. pneumoniae Moraxella catarrhalis*.  **Consider MRSA in all non-responders** | **Consider urgent ophthalmology review: mild peri-orbital cellulitis can be managed with oral co-amoxiclav.**  [**azithromycin** if penicillin allergy]  **ceftriaxone IV once daily if moderate/severe infection or if any concerns about orbital cellulitis [vancomycin and ciprofloxacin if severe penicillin allergy]**  **ADD metronidazole IV if severe infection:**   * Cannot see eye movements **or** * Eye movements are restricted or cannot be seen due to complete ptosis **or** * Condition worsens after 24 hrs therapy   **Patients with severe infection should have urgent initiation of treatment, imaging (CT) and referral to ENT and ophthalmology.** Imaging is **not** required for non-severe infection. | 10 days  May have oral switch to:  **co-amoxiclav**  [**azithromycin** if penicillin allergy]  Provide safety netting information (verbal and written) prior to discharge. |

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| **CYSTIC FIBROSIS SPECIALITY GUIDELINES** | | |
| **Assess previous sputum microbiology results (organisms isolated and their sensitivities)** | | |
| **Patient group** | **Most likely causal organisms** | **First choice** |
| **No previous *Pseudomonas aeruginosa*** | Must cover common pathogens including:  *Staph. aureus*  *H. influenzae Moraxella catarrhalis*  As well as possible first isolate (especially young infants) of:  *Pseudomonas aeruginosa* | **Cefuroxime IV**  **+ tobramycin IV**  See below if *Pseudomonas aeruginosa* isolated. |
| **Previous or proven current infection with *Pseudomonas aeruginosa*** | *Pseudomonas aeruginosa*  *H. influenzae Moraxella catarrhalis* | **Ceftazidime IV**  **+ tobramycin IV**  **(unless previous sensitivities suggest otherwise)** |
| *Staph. aureus* isolated within previous 12 months and patient NOT on long-term **azithromycin**  (or *Staph. aureus* reported **erythromycin**-resistant) | **Ceftazidime IV**  **+ tobramycin IV**  **+ flucloxacillin PO** |

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| **ONCOLOGY SPECIALITY GUIDELINES** |
| ***FEBRILE NEUTROPAENIA***  *REFER TO DETAILED PAEDIATRIC ONCOLOGY GUIDELINES IN ALL CASES* <http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-flowchart.pdf>   * Children who are neutropenic and unwell even if normothermic should be assumed to have infection and be treated appropriately. * Threshold of neutropenia for starting antibiotics (in the presence of fever) is 0.5 x 109/L. * Beware patients in whom ANC <1.0 x 109/L and falling rapidly.   **IMPORTANT:** Assess previous microbiology and consider previous unusual organisms (e.g. ESBL-producer requiring **meropenem**) |

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| **Patient group** | **Additional notes** | **Initial treatment [acceptable alternative]** |
| **Low risk** | * ALL maintenance treatment & most patients with solid tumours receiving 3 weekly blocks of chemotherapy   o except children with B- NHL & anaplastic lymphoma, or stage IV neuroblastoma   * Stage IV Wilms’ * Standard treatment for stage IV Hodgkin's with OEPA & COPP not receiving intensive chemotherapy | **Piperacillin/tazobactam 6hrly IV unless known colonised with resistant organisms. Commence intravenous antibiotics within 60mins**  **If patient has signs of severe sepsis** (listed below), add **gentamicin**   * desaturation * poor peripheral perfusion * hypotension * altered conscious state   Reduce dose if renal impairment / caution if recent cisplatin chemotherapy.  **If penicillin allergy or receiving high dose MTX use meropenem 8hrly**  For full guidance, see <http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-flowchart.pdf> In patients with bone tumours and a prosthesis, add **teicoplanin IV** if pain or erythema around prosthesis.  Continue **co-trimoxazole** prophylaxis (if taking), but stop **ciprofloxacin** prophylaxis. |
| **Standard risk** | * All oncology patients should be considered standard risk unless clearly defined as low risk * Factors increasing risk include:-   + Expectation to have severe neutropenia (<0.5 x 109/L) for more than 7 days   + Children with leukaemia not in remission, or following BMT will have severe neutropenia for 10 days or more and are at higher risk of developing Gram-negative sepsis or fungal infection   + Patients with external drains (eg nephrostomies, chest drains) | **Piperacillin/tazobactam 90mg/kg (max 4.5g) 6hrly IV unless known colonised with resistant organisms. Commence intravenous antibiotics within 60mins**  **If patient has signs of severe sepsis** (listed below), add **gentamicin 7mg/kg od**   * desaturation * poor peripheral perfusion * hypotension * altered conscious state   Reduce dose if renal impairment / caution if recent cisplatin chemotherapy.  For full guidance, see <http://www.piernetwork.org/uploads/4/7/8/1/47810883/febrile-neutropenia-flowchart.pdf>  **If penicillin allergy or receiving high dose MTX use Meropenem 20mg/kg (max 2g) 8hrly**  In patients with bone tumours and a prosthesis, add **teicoplanin IV** if pain or erythema around prosthesis. Continue **co-trimoxazole** prophylaxis (if taking), but stop **ciprofloxacin** prophylaxis. |

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| **ANTI-INFECTIVE DOSING RECOMMENDATIONS for neonates and children**  **PLEASE NOTE:-**   * **Dose adjustment may be required for renal impairment, hepatic impairment, obesity, therapeutic hypothermia or interacting drugs** * **Doses for other routes of administration, prophylactic use, community infections and specific indications may differ** * **Some doses may be unlicensed and differ from BNF-C recommendations** * **These are consensus guidelines agreed by local multidisciplinary infection specialists.** | | | |
| **DRUG** | **INTRAVENOUS DOSE** | **ORAL DOSE** | **OTHER ROUTES** |
| **Aciclovir** | **CNS/ severe infection**  **Preterm <30wks**: 20mg/kg 12-hourly  **< 3 mo**: 20mg/kg 8-hourly  **3 mo-<12 yr**: 500mg/m² 8-hourly  **12 yr and older**: 10mg/kg 8-hourly | **Herpes Simplex, treatment (immunocompetent) 1–23 mo**: 100mg 5 times a day  **2–17 yr**: 200mg 5 times a day  **Herpes Simplex, treatment, (immunocompromised)**  **1–23 mo:** 200mg 5 times a day  **2–17 yr**: 400mg 5 times a day  **Herpes zoster treatment (chickenpox/shingles) 1–23 mo**: 200mg 6-hourly  **2–5 yr**: 400mg 6-hourly  **6–11 yr**: 800mg 6-hourly  **12–17 yr**: 800mg 5 times a day. |  |
| **Amikacin**  Once daily regimen: pre-dose (trough)  <5mg/L. Multiple daily dose regimen: pre-dose (trough) <10mg/L. 1- hour post dose should not exceed 30mg/L. | **CF only:**  **>1yr**: 30mg/kg once daily (max 1.5g per dose), or 10mg/kg 8-hourly |  | **CF (nebulised using iv prep):**  **<12yr**: 250mg 12-  hourly  **>12yr**: 500mg 12-  hourly |
| **Amoxicillin** | **Sepsis, suspected Listeria meningitis or NEC**:-  **<7days**: 60mg/kg IV 12-hourly  **7-28days**: 60mg/kg IV 8-hourly | **All ages**: 40mg/kg 12-hourly (max 1g per dose) (BNF-C dosing is also acceptable) |  |

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|  | **>28 days-18yr**: 60mg/kg IV 8-hourly (max dose 1g every 8 hours)  **Enterococcal endocarditis**:  **<7days:** 60mg/kg 12-hourly  **7- 28days:** 60mg/kg 8-hourly.  **>28 days-18yr:** 60mg/kg 4–6 hourly (max 2g 4- hourly). |  |  |
| **Amphotericin (Ambisome®)** | **Treatment:**  **All ages**: test dose 100micrograms/kg (max 1mg) over 15mins, observe for 30mins. If no reaction follow 1 hr later by 3mg/kg once daily  **Prophylaxis**:  1mg/kg once daily on Mon, Wed, Fri |  |  |

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| **Azithromycin** |  | **All ages**: 10mg/kg (>40kg 500mg) once daily for 3 days. For tonsillitis, use 5 day course  **CF:** 10mg/kg (>40kg 500mg) once daily for 3 consecutive days per week as ongoing anti- inflammatory. For NTM 10mg/kg (>40kg 500mg) once daily each day of the week (in combination with other therapy) long term. |  |
| **Aztreonam** | **1mo-23mo**: 30mg/kg 6-hourly  **2-18yr**: 50mg/kg 8-hourly (max 2g tds) (In CF 6- hourly dosing may be used) |  | **CF: nebulised** (using aztreonam LYSINE nebs (do not nebulise IV vials): 75mg 8- hourly (alternate months) |
| **Bactroban®**  (mupirocin) |  |  | **MRSA eradication:** nasal 12-hourly/ 8- hourly for 5 days |
| **Benzylpenicillin** | **<7 days:** 50mg/kg 12-hourly  **7-28 days**: 50mg/kg 8-hourly  **>28 days-18yr**: 50mg/kg 6-hourly (max 2.4g per dose)  **Endocarditis**  **1mo-18yr**: 50 mg/kg 4 hourly (max. 2.4 g 4 hourly).  **Congenital syphilis iv/im**: 30mg/kg 12-hourly until age day 7, then 30mg/kg 8-hourly |  |  |
| **Caspofungin** | **<3mo:** 25 mg/m2 once daily.  **3–<12mo:** 50 mg/m2 once daily.  **1–17yr:** 70 mg/m2 once daily (max.70 mg) for 1 day, then 50 mg/m2 once daily (max. 70 mg); increased to 70 mg/m2 once daily (max 70 mg) if response inadequate |  |  |

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| **Cefalexin** |  | **1mo-18yr**: 25mg/kg 8-hourly (max 1g per dose) |  |
| **Cefotaxime** | **<7days**: 50mg/kg 12-hourly  **7-21days**: 50mg/kg 8-hourly  **21days-18yr**: 50mg/kg 8-hourly (6 hourly for meningitis)  (max. 12g per day)  **Neonatal dose banding option** for >0.5kg babies with early-onset sepsis (if over 7 days of age change to 50mg/kg 8-hourly):   |  |  | | --- | --- | | 0.5 – 1kg | 50mg 12-hourly | | 1 – 2kg | 100mg 12-hourly | | 2 – 3kg | 150mg 12-hourly | | 3 – 4kg | 200mg 12-hourly | | 4 – 5kg | 250mg 12-hourly | |  |  |
| **Cefoxitin** | **CF only:**  **>1mo**: 40mg/kg 6-hourly (max 3g/dose) |  |  |
| **Ceftazidime** | **<7days**: 50mg/kg 24-hourly  **7-20days**: 50mg/kg 12-hourly  **21days–18yr**: 50mg/kg 8-hourly (max. 6g daily except CF with pseudomonas chest infection when max 9g daily (if over 12yr up to 12g daily may be considered.) |  | **CF: (nebulised using iv prep)** 1g 12-hourly |
| **Ceftriaxone** | Can use ceftriaxone age <1 month **if ≥37 weeks gestation & no contraindications (see below)**  **<15 days**: 50 mg/kg once daily  **≥15 days**: 80mg/kg once daily (max 4g daily)  **2nd dose of ceftriaxone can be given between 12-24 hours following the first dose to facilitate ambulation –** [**see ID network statement**](https://www.piernetwork.org/uploads/4/7/8/1/47810883/ceftriaxone_statement_wessex_id_network_nov_2017_final.pdf)**.** |  |  |

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|  | **After an initial dose of 80mg/kg (up to 4g), subsequent doses of 50mg/kg can be administered at consultant discretion (do not administer 50mg/kg dose if possible meningitis, bone/joint infection or likely *Staph. aureus* infection**)  Contraindications to ceftriaxone use:  - **In neonates (up to 28 days of age)**:   * jaundice (bilirubin >50umol/L) * hypoalbuminaemia (albumin<25g/L) * acidosis (pH<7.35) * if IV calcium treatment or calcium containing solutions are required (or likely to be required)   - **In patients of any age**:   * ceftriaxone must not be mixed or administered simultaneously with any calcium-containing IV solutions (such as TPN or Hartmann’s), even via different infusion lines or at different infusion sites   o **in patients older than 28 days of age** ceftriaxone and calcium- containing solutions may be administered sequentially one after another through a different IV site or through the same IV site if thoroughly flushed with sodium chloride 0.9%.  **Dose of 80mg/kg can be administered over 10 minutes via syringe driver (requires prospective sign-off by local drugs and therapeutics committee). If under 1 month of age, administer over 60 minutes.**  **Avoid 10-minute infusion if child has received Hartmann’s solution, TPN or any other calcium containing solution in the preceding 24 hours. If patient has previously had a possible non-severe penicillin allergy, give first dose of ceftriaxone given 30 mins; if no reaction, subsequent doses can be given over 10 minutes–**[**see ID network statement**](https://www.piernetwork.org/uploads/4/7/8/1/47810883/ceftriaxone_statement_wessex_id_network_nov_2017_final.pdf)**.** |  |  |

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| **Cefuroxime** | **Treatment:**  **<7 days**: 50mg/kg 12-hourly  **7-20 days**: 50mg/kg 8-hourly  **21-28 days**: 50mg/kg 8-hourly  **>28 days**: 50mg/kg 8-hourly (Max. 1.5g per dose) (6-hourly in cystic fibrosis)  **Surgical prophylaxis**: 30mg/kg |  |  |
| **Chloramphenicol** | **<14 days**: 12.5mg/kg 12-hourly  **14-28 days**: 12.5mg/kg 8-hourly  **>1mo**: 12.5 mg/kg 6-hourly -increase to 25mg/kg 6- hourly in severe infections such as septicaemia and meningitis. **Higher doses must be reduced as soon as indicated and if used for >48hr plasma chloramphenicol concentrations must be monitored.** |  |  |
| **Chlorhexidine 4% (Hibiscrub)** |  |  | **MRSA eradication or pre-surgical decolonisation:** Bathe once daily for 5 days (shampoo hair days 2 and 4) |
| **Ciprofloxacin** | **<1mo:** 10 mg/kg 12-hourly  **>1mo:** 10 mg/kg 8-hourly (max. 400mg per dose) | **<1mo:** 15 mg/kg 12-hourly  **>1mo:** 20 mg/kg 12-hourly (max. 750mg per dose)  **AML prophylaxis:**  5mg/kg 12-hourly (max 250mg per dose) or 10mg/kg 12-hourly in Downs syndrome  **Prevention of secondary case of meningococcal meningitis (single dose)**  **0–4yr:** 30 mg/kg (max.125 mg)  **5–11yr:** 250 mg  **12–17yr:** 500 mg | **Intraperitoneal**: 25mg ciprofloxacin per litre of PD fluid |
| **Clarithromycin** | **0-18yr:** 7.5mg/kg 12-hourly (max. 500mg per dose) | **0-18yr**: 7.5mg/kg 12-hourly (max. 500mg per dose) |  |
| **Clindamycin** | **<14 days: 5mg/kg 8-hourly 14-28 days: 5mg/kg 6 hourly**  **>28 days-18yr**: 10 mg/kg 6-hourly (max. 1.2g per dose) | **<14 days: 5mg/kg 8-hourly 14-28 days: 5mg/kg 6 hourly**  **>28 days-18yr**: 6 mg/kg 6-hourly (max. 450mg per dose)  *(do not prescribe suspension without taste test)* |  |

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| **Co-amoxiclav** | **0-3mo**: 30mg/kg 12-hourly  **3mo-18yr**: 30 mg/kg 8-hourly (max.1.2g per dose) | **Twice-daily dosing Augmentin Duo®**  **Also prescribed as co- amoxiclav 400/57**  **strength** | **Three-times daily dosing** |  |
| **<2yr**: 0.3mL/kg  **2-6yr**: 5mL  **7-18yr**: 10mL  **12-18yr**: can be increased to 10ml 8-hourly in severe infection | **<1mo**: 0.25mL/kg **125/31** strength **1mo-6yr**: 0.25mL/kg  **250/62** strength (max 5ml)  **>6yr**: 0.3mL/kg **250/62** strength (max 10ml) or 1 tablet (500/125mg) |  |
| **Note: doses above may be HALVED for oral treatment of non-severe UTI** | |  |
| **Colistimethate sodium** | **CF:**  <60kg: 25,000units/kg 8-hourly  >60kg: 2MU 8-hourly |  | | **CF (nebulised - as Colomycin nebs)**:  <2yr: 1MU 12-hourly  >2yr: 2MU 12 hourly  **CF (nebulised – as Promixin via Ineb):**  <2yr: 0.5MU 12-  hourly  >2yr: 1 MU 12-  hourly |
| **Co-trimoxazole** | **PCP treatment**  **>28 days:** 60mg/kg 12-hourly for 14-21 days (or total daily dose may be divided in 3 or 4). Oral route preferred  **Stenotrophomonas treatment**:  **>28 days**:30mg/kg 12-hourly.Oral route preferred (as per LexiComp guidance) | **PCP treatment**  **>28 days:** 60mg/kg 12-hourly for 14-21 days (or total daily dose may be divided in 3 or 4).  **Stenotrophomonas treatment**:  **>28 days**:30mg/kg 12-hourly (as per LexiComp guidance)  **Prophylaxis:**  **<0.5m2**: 15-24mg/kg 12-hourly (max 240mg per dose) | |  |

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|  |  | **0.5-0.75m2**: 240mg 12-hourly **0.76-1.0m2**: 360mg 12-hourly **1.0-1.49m2**: 480mg 12-hourly  **>1.5m2**: 960mg 12-hourly  on 2 consecutive days per week |  |
| **Doxycycline** |  | Short courses can be used in children aged ≥8 years (Wessex ID network, supported by published data) [[Todd SR 2015](https://www.ncbi.nlm.nih.gov/pubmed/25794784)]  **≥8yr**: 2mg/kg 12-hourly (max 100mg/dose). |  |
| **Erythromycin** | Clarithromycin preferred for intravenous antibiotic treatment | Azithromycin preferred for oral antibiotic treatment |  |
| **Flucloxacillin** | **<7 days**: 50mg/kg 12-hourly **7-21days**: 50mg/kg 8-hourly **21-28days**: 50mg/kg 6-hourly  **Staphylococcal meningitis/cerebral abscess in neonate:** 100mg/kg/dose  **1mo-18yr**: 50mg/kg 6-hourly(max 2g per dose)  **Surgical prophylaxis**: 25mg/kg | **<7 days**: 25mg/kg 12-hourly **7-21days**: 25mg/kg 8-hourly **21-28days**: 25mg/kg 6-hourly **1mo- 2yr** 125mg 6-hourly  **2-10yr**: 250mg 6-hourly  **>10yr**: 500mg 6-hourly  *Do not prescribe suspension without taste test. Oral cephalexin preferred (better taste tolerability and 12- hourly dosing)* |  |
| **Fluconazole** | **Mucosal candidiasis**  **1mo-18yr**: 3 mg/kg daily (max.100 mg)  **Invasive candidal infections\***  **<14days**: 10-12mg/kg every 72hr  **14-28days**: 10-12mg/kg every 48hr  **1mo-18yr**: 10–12mg/kg once daily (max. 800mg per dose)  \* for **confirmed** candidal bloodstream infection give initial **loading dose** of 25mg/kg (max 1600mg)  **Prophylaxis in immunocompromised** | **Mucosal candidiasis**  **1mo-18yr**: 3 mg/kg daily (max.100 mg)  **Invasive candidal infections\***  **<14days**: 10-12mg/kg every 72hr  **14-28days**: 10-12mg/kg every 48hr  **1mo-18yr**: 10–12mg/kg once daily (max. 800mg per dose)  \* for **confirmed** candidal bloodstream infection give initial **loading dose** of 25mg/kg (max 1600mg)  **Prophylaxis in immunocompromised** |  |

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|  | **1mo-18yr**: 3-6 mg/kg daily (max.400 mg), dependent on degree and duration of neutropenia  **Prophylaxis in immunocompetent**  **<14days**: 3mg/kg every 72hr **14-28days**: 3mg/kg every 48hr **1mo-18yr**: 3mg/kg daily | **1mo-18yr**: 3-6 mg/kg daily (max.400 mg), dependent on degree and duration of neutropenia  **Prophylaxis in immunocompetent**  **<14days**: 3mg/kg every 72hr **14-28days**: 3mg/kg every 48hr **1mo-18yr**: 3mg/kg daily |  |
| **Fosfomycin** | **CF only**:  **1-12yr**: 100mg/kg 8-hourly  **>12yr**: 5g 8-hourly |  |  |
| **Ganciclovir** | **<1mo**: 6mg/kg 12-hourly  **1mo-18yr**: 5mg/kg 12-hourly | See ValGANciclovir |  |
| **Gentamicin** | [PIER Guideline](https://www.piernetwork.org/uploads/4/7/8/1/47810883/pier_gentamicin_guidelines_final_feb_2018_copy.pdf) or use local dosing guideline.  **Surgical prophylaxis**: 3mg/kg pre-op stat.  Cardiac surgery: 7mg/kg daily for 48hr (5mg/kg daily for 48hr in neonates). | **Bacterial overgrowth** (iv prep may be used orally): **All ages**: 2.5mg/kg 8-hourly. Absorption from GI tract should be negligible, but advisable to check level after first week of treatment. | **Intrathecal** – use intrathecal products only. Seek specialist advice. |
| **Isoniazid** |  | **Neonate:** 10mg/kg once daily  **Child:** see BNFC for TB doses |  |
| **Itraconazole**  Serum level monitoring available at Bristol. (prophylaxis trough/pre- dose 0.5-1mg/L, treatment trough/pre- dose 1-2mg/L) | **Treatment:**  **1mo-18yr**: 2.5mg/kg 12-hourly (max 200mg per dose) x 2 days (if iv continued then reduce to 2.5mg/kg (max 200mg) once daily, or continue with oral twice daily)  **Prophylaxis (immunocompromised):**  2.5mg/kg 12-hourly if oral route unavailable | **Treatment and prophylaxis:**  1mo-18yr: liquid 2.5mg/kg 12-hourly; capsules 3.75- 5mg/kg 12-hourly (60% higher bioavailability with liquid) |  |
| **Lamivudine** |  | Baby born to mother with HIV: 2mg/kg 12-hourly for 4 weeks  <http://www.chiva.org.uk/files/7714/2556/6911/bhivapreg12.pdf> |  |
| **Levofloxacin** | **6mo - <5 yr**: 8-10mg/kg 12-hourly (max 750mg per  dose) | **6mo-4yr**: 8-10mg/kg 12-hourly (max 750mg per  dose) |  |

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|  | **5-18yr**: 8-10mg/kg once daily (max 750mg per dose) | **5-18yr**: 8-10mg/kg once daily (max 750mg per dose) |  |
| **Linezolid** | **<7days:** 10 mg/kg 12-hourly, increased if necessary to 10 mg/kg 8-hourly  **7days–11yr:** 10 mg/kg 8-hourly (max. 600 mg/dose).  **12–17yr:** 600 mg 12-hourly | **<7days:** 10 mg/kg 12-hourly, increased if necessary to 10 mg/kg 8-hourly  **7days–11yr:** 10 mg/kg 8-hourly (max. 600 mg/dose).  **12–17yr:** 600 mg 12-hourly  Caution about use for >1 month duration due to toxicity |  |
| **Meropenem** | **<7days**: 20mg/kg 12-hourly  **>7days**: 20mg/kg 8-hourly  **Double dose in meningitis or CF** (max 2g per dose)  AVOID concurrent use of VALPROATE. (Meropenem or imipenem expected to reduce valproate blood concentrations by 90%). Seek expert advice on selecting alternative antibiotic or anti-epileptic. |  | **CF (nebulised using iv product):**  **<12yr**:250mg 12-  hourly;  **>12yr**:500mg 12-  hourly |
| **Metronidazole** | **Neonate - 2mo:**  **<26wk corrected:** 15mg/kg loading dose followed by 7.5mg/kg once daily (starting 24hr after loading dose)  **26-34wk corrected:** 15mg/kg loading dose followed by 7.5mg/kg 12-hourly (starting 12 hr after loading dose)  **>34wk – 2mo corrected:** 15mg/kg loading dose followed by 7.5mg/kg 8-hourly (starting 8hr after loading dose)  **2mo-18yr**: 7.5mg/kg 8-hourly (max 500mg per dose) | **1-2mo:** 7.5mg/kg 12-hourly  **2mo-12yr**: 7.5mg/kg 8-hourly (max. 400mg per dose)  **>12yr**: 400mg 8-hourly |  |
| **Micafungin** | **Invasive candidiasis:**  **Neonates- 3mo**: 4mg/kg once daily, increased if necessary according to response.  **>3mo (up to 40kg**): 2mg/kg once daily (dose may |  |  |

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|  | be doubled if patient response is inadequate)  **>40kg**: 100mg once daily (dose may be doubled if patient response is inadequate)  **CNS infection:**  **Neonates-3mo**: 10mg/kg once daily  **>3mo (up to 40kg**): 4mg/kg once daily  **>40kg**: 200mg once daily |  |  |
| **Mupirocin** |  |  | **MRSA eradication:**  nasal 8- hourly for 5 days |
| **Naseptin**  (chlorhexidine with neomycin) |  |  | **MRSA eradication**: nasal 6-hourly for 10 days |
| **Neviparine** |  | Baby born to mother with HIV:  2mg/kg once daily for 1st week, then 4mg/kg once daily for 2nd week, then stop (if mother has received more than 3 days nevirapine, use 4mg/kg once daily for 2 weeks, then stop)  <http://www.chiva.org.uk/files/7714/2556/6911/bhivapreg12.pdf> |  |
| **Nitrofurantoin** |  | **Treatment:**  **3mo-12yr**: 750micrograms/kg 6-hourly  **12-18yr**: 50mg 6-hourly (can increase to 100mg 6- hourly in severe chronic recurrent infections)  **Note:** suspension is expensive (Drug Tariff cost £447 for 300ml) |  |
| **Nystatin** |  | **Oral candidiasis**  All ages: 100 000 units 4 times a day usually for 7 days |  |
| **Octenisan** |  |  | **MRSA eradication or pre-surgical decolonisation:** Bathe once daily for 5 days (shampoo hair days 2 and 4) |
| **Oseltamivir** |  | **Treatment:**  **Prem <38wk** post conceptual age: 1mg/kg 12-hourly  **Prem 38-40wk** post conceptual age: 1.5mg/kg 12- |  |

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|  |  | hourly  **0-12mo**: 3mg/kg 12-hourly  **1-12yr**: <15kg: 30mg 12-hourly, 15-23kg: 45mg 12-hourly 23-40kg: 60mg 12-hourly  >40kg: 75mg 12-hourly  **Prophylaxis:**  **0-12mo**: 3mg/kg once daily  **1-12yr**: <15kg: 30mg once daily  15-23kg: 45mg once daily 23-40kg: 60mg once daily  >40kg: 75mg once daily |  |
| **Penicillin V (phenoxymethyl- penicillin)** |  | **1mo-1yr**: 62.5mg 6-hourly, or 125mg 12-hourly  **1-6yr**: 125mg 6-hourly, or 250mg 12-hourly  **6-12yr**: 250mg 6-hourly, or 500mg 12-hourly  **>12yr**: 500mg 6-hourly, or 1g 12-hourly (suspension is poorly tolerated, consider an  alternative such as amoxicillin. Compliance improved with 12-hourly dosing)  **Prevention of pneumococcal infection in asplenia or sickle-cell disease**  **0–11mo:** 62.5mg twice daily **1–4yr:** 125mg twice daily **5–17yr:** 250mg twice daily |  |
| **Piperacillin/ tazobactam** | **<1mo**: 90mg/kg 8-hourly  **>1mo**: 90mg/kg 8-hourly (max 4.5g/dose) Increase dose to **6 hourly** in oncology patients, immunocompromised patients and complicated intra-abdominal infections. |  |  |
| **Rifampicin** | **Treatment of staphylococcus aureus infection (not to be used as monotherapy):**  **All ages**: 10mg/kg 12-hourly (max 600mg per dose) | **Treatment of staphylococcus aureus infection (not to be used as monotherapy):**  **All ages**: 10mg/kg 12-hourly (max 600mg per dose)  **For TB**: see BNF-C |  |

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|  |  | **Prevention of secondary case of meningococcal meningitis**  **0-11mo:** 5mg/kg 12-hourly for 2 days.  **1–18yr:** 10mg/kg 12-hourly (max. 600mg/dose) for 2 days. |  |
| **Teicoplanin** | **<1mo:** 16 mg/kg loading dose, then 8 mg/kg once daily, starting 24 hours after loading dose.  **≥1mo:**10 mg/kg 12-hourly for 3 doses, then 10 mg/kg once daily (max400 mg/dose) |  |  |
| **Tobramycin**  For 8-hourly dosing monitor levels 2hr before and 1hr after the 2nd dose and again on day 8.  For once daily dosing monitor trough levels 18 hr after 1st dose and repeat on day 8.  Target trough <1mg/L | **1mo-1yr**: 3mg/kg 8-hourly  **>1 yr-18yr**: 7mg/kg once daily for non-CF patients (inc. PCD patients)  **CF only:**  **1mo-1yr**: 7mg/kg once daily  **>1yr**:10mg/kg once daily (may be switched to 3.3mg/kg 8-hourly bolus dosing for home). |  | **CF (nebuliser solution not iv prep)**: 300mg 12- hourly (alternate months) |
| **Trimethoprim** |  | **Prophylaxis:**  **All ages**: 2mg/kg once daily at night (max 100mg/dose)  **Treatment:**  **<1mo**: Initially 3mg/kg for 1 dose, then 2mg/kg 12- hourly  **>1mo**: 4mg/kg 12-hourly (max 200mg/dose) |  |
| **Valaciclovir** |  | **Treatment of herpes simplex or herpes zoster in immunocomprosed patients:**  **3mo - <12 yr**: 20mg/kg 8-hourly (suspension will need to be made up specially in hospital pharmacy)  **≥12yr**: 1 gram 8-hourly |  |

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|  |  | **Treatment of herpes simplex or herpes zoster in immunocompetent patients:**  **3mo - <12 yr**: 10mg/kg 8-hourly (suspension will need to be made up specially in hospital pharmacy)  **≥12yr**: 500mg 8-hourly |  |
| **Valganciclovir** |  | **Congenital CMV**  16mg/kg 12-hourly |  |
| **Vancomycin** | Treatment – [link to PIER guidelines](http://www.piernetwork.org/uploads/4/7/8/1/47810883/vancomycin.pdf) or use local dosing guidelines | **1mo-4yr**: 10mg/kg 6-hourly (max 125mg per dose)  **5-11yr**: 125mg 6-hourly  **>12yr**: 250mg 6-hourly  For inpatient use, injection may be given orally. Reconstitute a 500mg vial with 10mL of sterile water for injection to give a 50 mg/ml solution.  Reconstituted vial can be stored in the fridge for 24 hours. Label vial with the patient’s name and “for oral use only” to avoid inadvertent administration by the wrong route. | **Intrathecal**: 10mg every 24 hours (consider reducing to 5mg if ventricular size reduced or increasing to 15- 20mg if ventricular size increased). If CSF not draining freely, reduce dose frequency to once every 2-3 days  **Intraperitoneal**: 30mg vancomycin per litre of PD fluid  **CF(nebulised using iv prep)**: 4mg/kg 6 to12- hourly (max 250mg/dose) |

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| **Voriconazole**  Serum level monitoring available at Bristol. (treatment trough/pre- dose 1.0-4.5mg/L) | **2-12yr (or 12-15yr and <50kg):** 9mg/kg 12-hourly for 2 doses, then 8mg/kg 12-hourly (reduce in steps of 1mg/kg if not tolerated, increase in steps of 1mg/kg if inadequate response)  **15-18yr (or 12-15yr and >50kg):** 6mg/kg 12-hourly for 2 doses, then 4mg/kg 12-hourly (reduced to 3mg/kg every 12hrs if not tolerated) | **Treatment should be initiated with intravenous regimen.** Oral should be considered only after significant clinical improvement  **2-12yr (or 12-15y and under 50kg)**: 9mg/kg 12- hourly (max 350mg starting dose)  **15-18yr (or 12-15yr and over 50kg)**: 400mg 12- hourly for 2 doses, then 200mg 12-hourly (increased to 300mg if needed)  **15-18yr (and under 40kg)**: 200mg 12-hourly for 2  doses, then 100mg 12-hourly (increased to 150mg if needed) |  |
| **VZIG**  See local guidelines for assessment and  prescription forms to be completed |  |  | **Intramuscular** 0-5yr: 250mg 6-10yr: 500mg  11-14yr: 750mg  >15y: 1g |
| **Zidovudine** | Baby born to mother with HIV: **Prem**: 1.5 mg/kg 12-hourly **Term**: 1.5 mg/kg 6-hourly  <http://www.chiva.org.uk/files/7714/2556/6911/bhivapreg12.pdf> | Baby born to mother with HIV:  **Prem** <30wk: 2 mg/kg 12-hourly for 4 wk  **Prem** 30-34wk: 2 mg/kg 12-hourly for 2wk, then 2 mg/kg 8-hourly for 2wk  **Term** >34wk: 4 mg/kg 12-hourly  <http://www.chiva.org.uk/files/7714/2556/6911/bhivapreg12.pdf> |  |

# Penicillin allergy



*   Penicillin

allergy (see page 50)

* Penicillins are life-saving antibiotics and children should not be labelled ‘penicillin-allergic’ without careful consideration.
* Life-threatening adverse reactions to penicillins due to immediate hypersensitivity (IgE mediated) are rare. A reliable history is key.

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| **Characteristics** | **Type I immediate hypersensitivity reactions** | **Non-Type I reactions**  **(Types II-IV and idiosyncratic)** |
| **Timing of onset** | 1 to 4 hours from exposure (up to 72 hours) | >72 hours from exposure |
| **Clinical signs** | Anaphylaxis Laryngeal oedema  Wheezing / bronchospasm Angioedema  Urticaria / pruritis Diffuse erythema | Maculopapular rash Morbilliform rash   RBCs /  platelets  Drug fever (serum sickness) Tissue injury (immune complex)  Contact dermatitis |

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| **Allergy severity** | **Examples** | **Antibiotic colour-coding** |
| **Severe /**  **Life-threatening** | * Anaphylaxis or other Type I hypersensitivity reaction * Severe skin reaction (e.g. Stevens Johnson Syndrome) | **RED** drugs **contra-indicated**  **ORANGE** drugs **contra-indicated** unless no alternative and benefit outweighs risk (seek senior advice)  **GREEN** drugs **safe** |
| **Non-severe** | * Mild non-Type I reactions * Mild skin reactions | **RED** drugs **contra-indicated** unless no alternative and benefit outweighs risk **ORANGE** drugs may be used **with caution**  **GREEN** drugs **safe** |

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| **Red** | **Orange** | **Green** | |
| **Amoxicillin**  **Augmentin (co-amoxiclav) Benzathine penicillin Benzylpenicillin (Penicillin G) Flucloxacillin**  **Penicillin V (phenoxymethylpenicillin) Piperacillin**  **Procaine penicillin Piptazobactam (Tazocin) Timentin (ticarcillin-clavulanic acid)** | **Cefaclor Cefalexin Cefixime Cefotaxime Ceftazidime Ceftriaxone Cefuroxime Ertapenem**  **Imipenem (Primaxin) Meropenem** | **Amikacin Azithromycin Aztreonam Chloramphenicol Ciprofloxacin Clarithromycin Clindamycin**  **Colistimethate (Colistin) Co-trimoxazole Doxycycline Erythromycin Gentamicin**  **Linezolid** | **Metronidazole Nitrofurantoin Norfloxacin Ofloxacin Rifampicin Sodium fusidate Sulfadiazine Teicoplanin Tetracycline Trimethoprim Tobramycin Vancomycin** |

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| **Antibiotic prescribing audits** | |
| Hospital Antibiotic Prudent Prescribing Indicator (HAPPI) audits of the standards below will be carried out regularly. | |
| **Documentation** | **Prescribing standards** |
| Medical notes and ePrescribing | 1. Indication or provisional diagnosis (including severity of infection) documented for all antibiotics on their start date 2. Empirical choice of antibiotic(s) regimen according to UHS guideline or documented valid justification\* for off-guideline choice 3. Dose of antibiotics appropriate for age, weight, organ function and severity of infection 4. Documented evidence of review of antibiotic prescription at 48-72 hours with plan for ongoing therapy if required |

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