



WESSEX FIRST-LINE EMPIRICAL ANTIBIOTIC THERAPY FOR SPECIFIC CHILDHOOD INFECTIONS



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IMPORTANT

All drug doses are based on normal renal function.

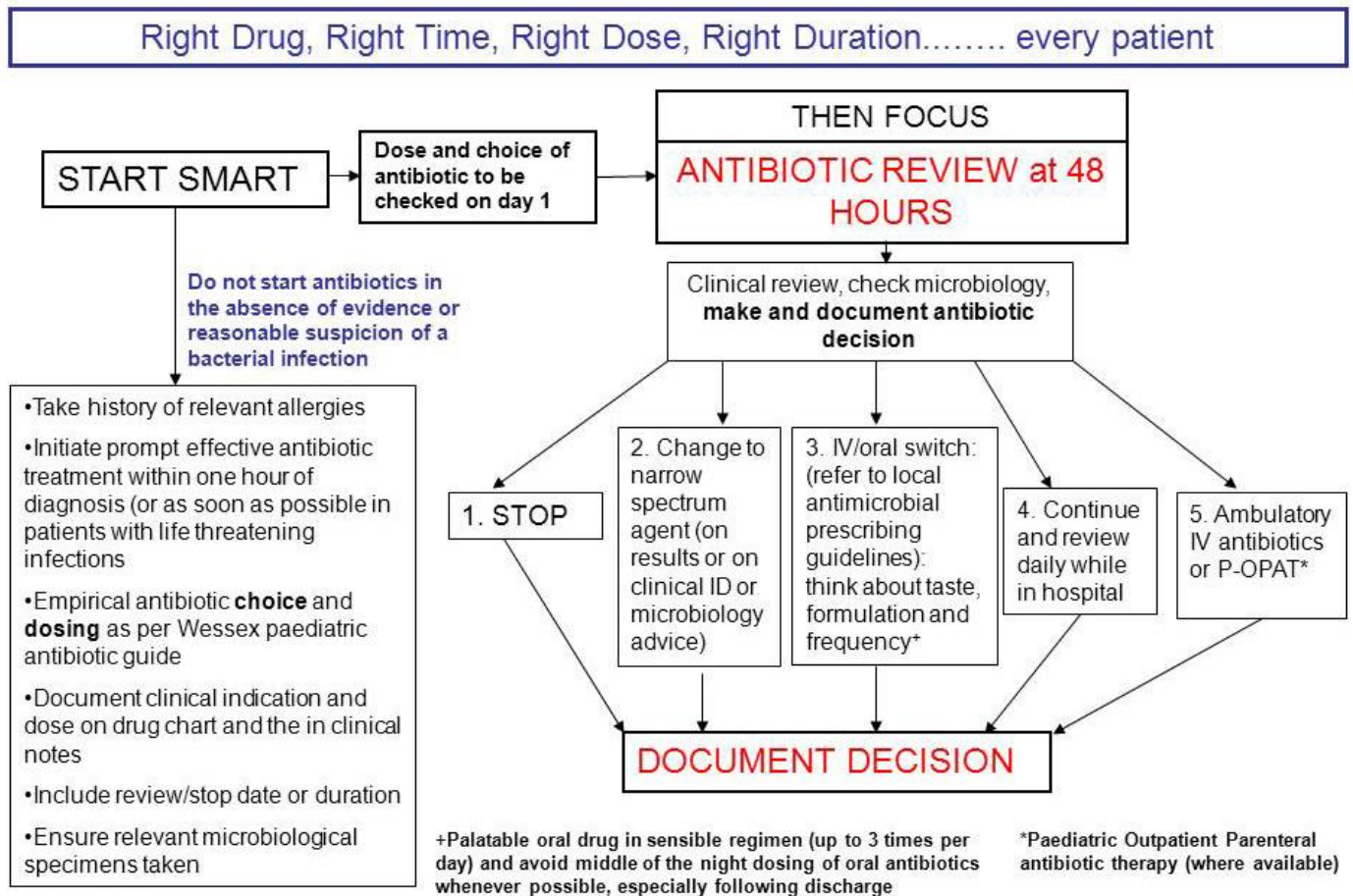
For dosing in renal impairment, contact the ward pharmacist.

Typical durations are for uncomplicated infections. Patients with abscesses, infected prosthetic material or co-morbidity may require longer courses or surgical intervention.

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

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

Paediatric antimicrobial stewardship



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

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

- Clinical condition of the patient is improving and haemodynamically stable.
- Afebrile for > 24 hours (temperature < 38°C).
- Trend towards normalisation of CRP (<20mg/L or <1/3 highest level).
- Able to tolerate oral medication and appropriate oral antimicrobial available.
- Functioning gastrointestinal tract without risk of malabsorption.
- No haematological malignancy or neutropenia.
- No serious infections that requires IV antibiotics for total course, such as meningitis, endocarditis, exacerbations of cystic fibrosis.

Treatment for osteomyelitis and septic arthritis - consider change to oral therapy when pain free and apyrexial >24 hours and CRP <20 or <1/3 of highest value.

Generalised Sepsis

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
<p>SEPSIS community-acquired (if identifiable source, please consult appropriate section)</p>	<p><i>Strep. pneumoniae</i> <i>N. meningitidis</i> <i>Staph. aureus</i></p> <p>(Rarely <i>H. influenzae</i>, <i>enterobacteriaceae</i> & <i>Salmonella spp</i>)</p>	<p><1 month age: Cefotaxime IV + Amoxicillin IV (to cover <i>Listeria</i>) Stop Amoxicillin once <i>Listeria</i> meningitis excluded by normal CSF microscopy and negative blood and CSF cultures at 48 hours.</p> <p>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 (high dose for age) if vesicular rash, haemodynamically unstable, abnormal clotting/LFTs or CSF pleocytosis.</p> <p>Age > 1 month: Ceftriaxone 80mg/kg IV</p> <p>[Chloramphenicol if severe penicillin allergy]</p>	<p>7 days</p>
<p>Presumed central venous line infection</p>	<p>Coagulase negative <i>staphylococci</i> <i>Staph. aureus</i> Gram negative bacteria (<i>E. coli</i>, <i>Klebsiella</i>, <i>Pseudomonas</i>) Rarely <i>Candida</i></p>	<p>Vancomycin and gentamicin</p> <p>If translocation from gut suspected, add metronidazole. If likely <i>pseudomonas</i> infection or severe sepsis, use piperacillin/tazobactam. Consider empirical caspofungin if severe sepsis (discuss with microbiology/ID team)</p> <p>If gastro patient or home TPN, see gastro speciality guidelines</p> <p>Note: check previous microbiology for evidence of resistant organisms.</p>	<p>Monitor renal function and antibiotic levels.</p> <p>Duration depends on removal of line, organism isolated – to discuss with microbiology/ID team.</p>

NEONATAL GUIDELINES		
Assess previous microbiology results including multi-resistant bacteria or fungal infections. Contact duty microbiologist if in any doubt.		
Patient group	Most likely causal organisms	First choice
Early onset sepsis (<72 hours of age)	Group B <i>streptococcus</i> <i>E. coli</i> Rarely <i>Listeria monocytogenes</i>	Cefotaxime IV OR Benzylpenicillin IV and gentamicin IV (NICE recommendation) If Listeria suspected, add amoxicillin.
Late onset sepsis (≥72 hours of age)	Coagulase negative <i>staphylococcus</i> <i>Staph. aureus</i> Gram negative organisms Consider fungal infections such as <i>Candida</i>	Flucloxacillin IV and gentamicin IV. If central line in situ, for vancomycin IV and gentamicin IV (teicoplanin IV instead of vancomycin for Winchester/Basingstoke). Consider empirical antifungal therapy based on previous microbiology and discuss with microbiology/ID team. 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.
Neonatal meningitis	Group B <i>streptococcus</i> Gram negative organisms including <i>E. coli</i> Uncommon: <i>Listeria monocytogenes</i> (very rare beyond 1 month of age)	Cefotaxime IV If Listeria suspected, add amoxicillin Duration of Ab course:- Group B <i>streptococcus</i> : ≥ 14 days <i>E. coli</i> : 21 days <i>Listeria</i> : 14-21 days (amoxicillin + gentamicin, stop gentamicin after 7 days)
Presumed central line infection	Coagulase negative <i>staphylococcus</i> <i>Staph. aureus</i> Gram negative organisms Rarely fungal infections such as <i>Candida</i>	Vancomycin IV and gentamicin IV. (teicoplanin IV instead of vancomycin for Winchester/Basingstoke). For minor line infections, consider teicoplanin IV instead of vancomycin . Monitor renal function and antibiotic levels. Duration depends on removal of line, organism isolated – to discuss with microbiology/ID team.
Periumbilical cellulitis	<i>Staph. aureus</i>	Flucloxacillin IV

<p>Necrotising enterocolitis</p>	<p>Gram negatives (including <i>enterobacteriaceae</i> and <i>Pseudomonas aeruginosa</i>) <i>Enterococcus</i> Anaerobes</p>	<p>Flucloxacillin IV, gentamicin IV and metronidazole IV.</p> <p>If central line in situ, consider vancomycin IV, gentamicin IV and metronidazole IV (teicoplanin IV instead of vancomycin for Winchester/Basingstoke).</p> <p>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.</p>
<p>Meningitis</p>	<p>Group B <i>streptococcus</i> <i>E. coli</i></p>	<p>Cefotaxime IV. Add gentamicin IV if haemodynamically unstable.</p>

Central Nervous System

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
<p>Meningitis</p>	<p>95% beyond 3 months of age caused by:</p> <ul style="list-style-type: none"> <i>Neisseria meningitidis</i> <i>Strep. pneumoniae</i> <i>H. influenzae</i> (unvaccinated) <p>Consider TB</p> <p><u>Travel history:</u> Important if possible exposure to penicillin-resistant pneumococcus (Southern or Eastern Europe & USA)</p> <p><u>Normal ranges for CSF:-</u> 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</p> <p>Take adequate volume of CSF to ensure all requested tests can be processed. <u>Safe recommended CSF</u></p>	<p><1 month of age: Cefotaxime IV + Amoxicillin IV (to cover Listeria) Stop Amoxicillin once <i>Listeria meningitis</i> excluded by negative blood and CSF cultures at 48 hours.</p> <p>If < 6 weeks of age, consider aciclovir IV (high dose for age) for treatment of neonatal HSV.</p> <p>>1 month of age: Ceftriaxone 80 mg/kg IV</p> <p>Add oral or IV Rifampicin if relevant travel history</p> <p>[chloramphenicol if severe penicillin allergy]</p> <p>Start dexamethasone if suspected bacterial meningitis. Indicators include turbid CSF, CSF WCC>1000, raised CSF WCC <u>and</u> CSF protein >1000 mg/L, or positive Gram stain. Dexamethasone is not</p>	<p><i>N. meningitidis</i>: 7 days</p> <p><i>H. influenzae</i>: 10 days</p> <p><i>Strep. pneumoniae</i>: 14 days</p> <p>Group B <i>streptococcus</i>: ≥ 14 days</p> <p><i>E. coli</i>: 21 days</p> <p><i>Listeria</i>: 14-21 days (amoxicillin + gentamicin, stop gentamicin after 7 days)</p>

	<p>volumes:- 2ml age < 5 years 4ml ≥ 5 years</p>	<p>indicated in children < 3 months of age.</p>	
<p>Encephalitis/ Meningo-encephalitis</p>	<p>For list of bacterial pathogens see meningitis</p> <p>Commonly viral including: HSV, enteroviruses, EBV, VZV, CMV, measles, mumps, arboviruses, haemorrhagic fever, rabies.</p> <p><i>Mycoplasma pneumoniae</i> Consider TB</p> <p><u>Travel history important</u></p>	<p><1 months age: Cefotaxime IV + Amoxicillin IV (to cover Listeria) + Aciclovir IV (high dose for age) Stop Amoxicillin once <i>Listeria</i> meningitis excluded by negative blood and CSF cultures at 48 hours.</p> <p>>1 month of age: Ceftriaxone 80mg/kg IV + Aciclovir IV (high dose for age)</p> <p>[Chloramphenicol if severe penicillin allergy]</p> <p>A macrolide such as azithromycin should only be used empirically if the patient presents with respiratory symptoms (use doxycycline po if age>12 years)</p> <p>Consider oseltamivir in influenza A season</p>	<p>Dependent on aetiology. Prolonged treatment often indicated.</p> <p>Notes: send CSF for HSV, VZV and enterovirus PCR and stool, blood (EDTA) and throat swab for enterovirus PCR.</p>
<p>Brain abscess/ subdural empyema</p>	<p><i>Streptococcus milleri</i> group <i>H. influenzae</i> Anaerobes Mixed infection common <i>Staph. aureus</i> if history of trauma or surgery <i>Nocardia</i> and fungal infections (<i>Aspergillus</i>) in immunocompromised patients</p>	<p><1 month of age: Cefotaxime IV, metronidazole IV + Amoxicillin IV (to cover Listeria) Stop Amoxicillin once <i>Listeria</i> meningitis excluded by negative blood and CSF cultures at 48 hours.</p> <p>>1 month: Ceftriaxone 80mg/kg IV + metronidazole (po or IV)</p>	<p>6 weeks</p> <p>Discuss timing of IV to oral switch with ID team</p>
<p>Ventriculoperitoneal shunt infection</p>	<p>Coagulase negative staphylococci <i>Staph. aureus</i></p>	<p>Vancomycin IV and ceftriaxone 80mg/kg IV (Cefotaxime IV if <1 month of age) Consider intrathecal vancomycin through external ventricular drain.</p>	<p>Minimum 7 days but depends on subsequent CSF cultures.</p>

Respiratory

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Pneumonia, Community Acquired (CAP)	<p><i>Strep. pneumoniae</i> Non-typeable <i>H.influenzae</i> <i>Staph. aureus</i> <i>Moraxella catarrhalis</i> <i>Mycoplasma pneumoniae</i> <i>Chlamydia pneumoniae</i> <i>Bordetella</i> spp Viral (esp RSV) TB</p>	<p>If non-severe: Amoxicillin PO (or co-amoxiclav PO if amoxicillin use in previous 4 weeks) If atypical organism (<i>mycoplasma</i>) considered in school age children, use azithromycin PO</p> <p>If severe: Cefuroxime IV (Consider ambulating on ceftriaxone 80mg/kg IV)</p> <p>+ Azithromycin PO (or Clarithromycin IV)</p> <p>< 1 month of age treat with cefotaxime IV until meningitis excluded. Consider azithromycin for pertussis or <i>Chlamydia</i> if under 4 months or unimmunised</p>	<p>Dependent on organism. Usually 5-7 days minimum (may have oral switch: Co-amoxiclav +/- 3 day course of azithromycin)</p> <p>[Azithromycin if penicillin allergy]</p>
Ventilator associated pneumonia (for NICU patients, see neonatal guidelines)	<p>Community acquired organisms most likely if early-onset VAP (See above)</p> <p><i>Enterobacter cloacae</i>, <i>Pseudomonas aeruginosa</i>, <i>Acinetobacter</i> species, <i>Stenotrophomonas maltophilia</i> <i>Staph. aureus</i> (including MRSA)</p>	<p>If <5 days since admission, Cefuroxime IV. If already on cefuroxime at the time of respiratory deterioration, switch to piperacillin/tazobactam IV.</p> <p>If >5 days since admission, piperacillin/tazobactam IV.</p>	<p>Await BAL results and review.</p> <p>If confirmed VAP, 5-7 days</p>
Pleural empyema	<p><i>Strep. pneumoniae</i> <i>Staph. aureus</i> Non-typeable <i>H.influenzae</i></p>	<p>Cefuroxime IV Add clindamycin if any evidence of toxin mediated disease (haemodynamic instability, mucosal erythema, rash, diarrhoea etc). Consider ambulating on ceftriaxone 80mg/kg IV if indicated</p>	<p>Usually 2 weeks minimum. Consider IV to oral switch (co-amoxiclav) once fever resolving and CRP normalising.</p> <p>[Azithromycin PO if penicillin allergy]</p>

Gastrointestinal

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Bloody diarrhoea AND septic	Non-typhoidal <i>Salmonella</i> <i>Shigella</i> <i>E. coli</i> <i>Campylobacter</i>	Ceftriaxone 80mg/kg IV If haemolytic uraemic syndrome suspected, please discuss with infection team	5 days
Community acquired peritonitis	Gram negative organisms such as <i>E. coli</i> Anaerobes	Ceftriaxone 80mg/kg IV and metronidazole IV/PO	5 days
<i>Clostridium difficile</i> associated diarrhoea	Children under 2 years of age should not be tested for <i>C. difficile</i> <i>C. difficile</i> toxin positive or PCR positive suggests <i>C. difficile</i> associated 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	10-14 days

Skin & Soft Tissue

INFECTION	Most likely causal organisms	First choice [acceptable alternative]	Suggested MINIMUM duration of antibiotic therapy
Cellulitis	<p><i>Staph. aureus</i> Group A <i>streptococcus</i> Group G <i>streptococcus</i></p> <p>Consider α-haemolytic <i>streptococci</i> or anaerobes if facial cellulitis</p>	<p>If mild, oral cefalexin or oral co-amoxiclav.</p> <p>If moderate / severe:- Flucloxacillin IV [Cefuroxime IV if mild/moderate penicillin allergy or clindamycin if severe penicillin allergy]</p> <p>Add clindamycin if associated sepsis / signs of toxin mediated disease (risk factors include chickenpox or burns).</p> <p>(+ Gentamicin if peri-anal cellulitis)</p> <p>Add metronidazole if facial cellulitis (see ophthalmology section for periorbital cellulitis)</p> <p>Consider ambulation and daily review on ceftriaxone 80mg/kg IV (+- metronidazole po)</p>	<p>7 days (may have oral switch)</p> <p>Oral Cefalexin or co-amoxiclav</p> <p>or [Clarithromycin if penicillin allergy]</p> <p>or Co-amoxiclav for facial cellulitis</p>
Impetigo	<p><i>Staph. aureus</i> Group A <i>streptococcus</i></p>	<p>Flucloxacillin IV</p> <p>[Cefuroxime for mild/moderate penicillin allergy, clindamycin if severe penicillin allergy]</p>	<p>5 days (may have oral switch)</p> <p>Oral options – see cellulitis (above)</p>
Bites	<p><i>Staph. aureus</i> <i>Bacteroides</i> species <i>Pasteurella multocida</i> Group A <i>streptococcus</i> (human bites)</p> <p>Often polymicrobial (aerobic + anaerobic)</p>	<p>Highest rates of infection with cat and human bites. Start antibiotics if:-</p> <ul style="list-style-type: none"> ○ Penetrating cat or human bite ○ Delayed presentation >8 hours from dog bite or other mammal <p>Injury involving underlying structures (tendons / bones / joints) or hands/feet/face</p> <p>If mild/moderate injury, for oral co-amoxiclav.</p> <p>If severe or deep penetrating, IV ceftriaxone 80mg/kg IV and metronidazole PO initially.</p> <p>[azithromycin and metronidazole if penicillin allergy]</p>	<p>7 days if mild penetrating injury.</p> <p>14 days if severe or deep penetrating injury – IV antibiotics followed by oral co-amoxiclav.</p> <p>Consider tetanus and hepatitis B vaccine if human bite. Consider tetanus immunoglobulin if animal bite in children with incomplete tetanus immunisation status.</p>

Bone & Joint

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Osteomyelitis or septic arthritis	<p><i>Staph. aureus</i> <i>Strep. pneumoniae</i> Group A <i>streptococcus</i> <i>H. influenzae</i> <i>Kingella kingae</i></p> <p>Consider TB <i>Salmonella</i> in Sickle cell</p>	<p>< 1 month of age treat with cefotaxime IV until meningitis excluded. Children under 1 month of age with serious bacterial infection require a LP unless contraindicated.</p> <p>1-3 months ceftriaxone 80mg/kg od until meningitis excluded.</p> <p>≥3 months-5yrs: Cefuroxime IV</p> <p>≥6 yrs: Flucloxacillin IV (Clindamycin IV if penicillin allergy)</p> <p>Ceftriaxone 80mg/kg IV in sickle cell disease or if no HiB vaccine</p>	<p>SEE BONE & JOINT INFECTION GUIDELINE</p> <p>Duration guided by clinical signs and CRP. Usual: 4-6 wks Septic arthritis: 2-3 wks</p> <p>Consider IV to oral switch when improvement in pain, resolution of fever and CRP<20mg/L or <1/3 of highest CRP</p>

Urinary tract

INFECTION	Most likely causal organisms	First choice [acceptable alternative]	Suggested MINIMUM duration of antibiotic therapy
UTI uncomplicated	<p><i>E. coli</i> <i>Klebsiella spp.</i> <i>Proteus spp.</i> <i>Staph. saprophyticus</i></p>	<p><3 months of age : treat as pyelonephritis (see below)</p> <p>>3 months of age: Trimethoprim PO</p> <p>If previous treatment with trimethoprim in preceding 4 weeks, use co-amoxiclav PO</p> <p>[Ciprofloxacin PO if penicillin allergy]</p>	<p>3 days</p> <p>(advise parents to seek reassessment if still unwell after 24-48 hrs)</p>
Pyelonephritis or UTI with septicaemia	<p>As above + <i>Pseudomonas aeruginosa</i></p>	<p><1 month of age: cefotaxime IV. Stat gentamicin if haemodynamically unstable. Children under 1 month of age with serious bacterial infection require a LP unless contraindicated.</p> <p>>1 month of age: ceftriaxone IV 80mg/kg IV. Stat gentamicin IV if haemodynamically unstable.</p> <p>Consider adding gentamicin if</p>	<p>Dependent on clinical response.</p> <p>Usual minimum 10 days.</p> <p>Choice of oral switch agent on basis of sensitivities</p>

		<p>previous renal pathology or recurrent UTIs.</p> <p>[Piperacillin/tazobactam IV monotherapy if gentamicin contra-indicated]</p> <p>[Ciprofloxacin +- gentamicin if severe penicillin allergy]</p>	
Peritoneal-dialysis associated peritonitis	<p>Coagulase –ve <i>staphylococci</i> <i>Staph. aureus</i> <i>Enterococcus</i> Gram negative organisms including <i>E coli</i>, <i>Klebsiella</i> and <i>Pseudomonas</i> Consider fungal infection</p>	<p>Vancomycin and ciprofloxacin added to dialysis fluid</p>	14 days

Cardiovascular

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

Surgical			
INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Appendicitis	Gram negative organisms including <i>E. coli</i> , <i>Klebsiella</i> and <i>pseudomonas</i> . Anaerobes	<p>If simple appendicitis, single pre-op dose ceftriaxone 80mg/kg IV and metronidazole IV</p> <p>For treatment of presumed perforated appendicitis:- Ceftriaxone 80mg/kg IV and metronidazole (IV initially)</p> <p>If clinical deterioration post-op, consider piptazobactam IV, metronidazole (IV initially) and gentamicin IV.</p> <p>[Metronidazole IV, teicoplanin IV and gentamicin IV if severe penicillin allergy]</p>	<p>If perforated appendicitis, minimum 5 days. IV to oral switch (co-amoxiclav if apyrexial day 3)</p> <p>If possible leak, start treatment as for perforated appendicitis and review with cultures at 48 hours.</p>
Surgical site infections	<i>Staph. aureus</i>	<p>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</p> <p>If systemic antibiotic treatment required, use cefuroxime IV</p> <p>Use vancomycin IV if known MRSA colonised.</p> <p>If no improvement, switch to piperacillin/tazobactam IV and consider if source control is required.</p>	<p>7 days</p> <p>Consider IV to oral switch using cefalexin or co-amoxiclav.</p>
Sternal wound infections post cardiothoracic surgery	<i>Staph. aureus</i>	<p>Flucloxacillin IV. Consider debridement, vacuum-assisted closure.</p> <p>[clindamycin if penicillin allergy]</p> <p>If no improvement, consider switch to vancomycin IV</p> <p>Vancomycin IV empirically if known MRSA colonised.</p>	<p>If no debridement required, 2 weeks. If debridement, for 4 weeks.</p> <p>Consider IV to oral switch: Cefalexin Co-amoxiclav Flucloxacillin</p> <p>[Clarithromycin if penicillin allergy]</p> <p>Do NOT use oral Flucloxacillin without a taste test</p>
Necrotising enterocolitis or typhlitis	Gram negative organisms such as <i>E. coli</i> and <i>Klebsiella</i> . <i>Enterococcus</i>	<p>Flucloxacillin IV, gentamicin IV and metronidazole IV</p> <p>If central line in situ, consider</p>	<p>7 days but increase to 10-14 days if necrotic gut requiring resection.</p>

	<i>Pseudomonas</i> spp. Anaerobes	vancomycin IV, gentamicin IV and metronidazole IV If overwhelming sepsis or bowel perforation, consider piptazobactam IV, gentamicin IV and metronidazole IV (+- vancomycin IV if central line in situ)	Monitor renal function and antibiotic levels.
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Ophthalmology

INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Peri-orbital and orbital cellulitis	As non-facial and also: <i>H. influenzae</i> (non-typeable) <i>Strep. pneumoniae</i> <i>M. catarrhalis</i> . Consider MRSA in all non-responders	Ceftriaxone 80 mg/kg IV once daily ADD Metronidazole IV if severe infection: <ul style="list-style-type: none"> • 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]
Ophthalmia neonatorum	<i>Neisseria gonorrhoeae</i> <i>Chlamydia trachomatis</i> <i>Staph. aureus</i> Consider HSV if vesicular lesions	Ceftriaxone IV/IM 50mg/kg single dose (dose for children <1 month) (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 <i>Chlamydia</i> 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) <i>Staph. aureus</i> <i>H. influenzae</i> (non-typeable) <i>Strep. pneumoniae</i>	Usually no treatment required Consider chloramphenicol eye drops and chloramphenicol ointment 1%	Continue until 2 days after symptoms resolved

ENT guidelines			
INFECTION	Most likely causal organisms	First choice	Suggested MINIMUM duration of antibiotic therapy
Tonsillitis	Group A <i>Streptococcus</i> Consider viral aetiology	Penicillin V PO for 10 days If unable to tolerate oral antibiotics, use ceftriaxone 80mg/kg IV and consider ambulating [Azithromycin PO for 5 days for penicillin allergy] Only treat with antibiotics if <u>confirmed</u> Gp A strep or 3 out of 4 of exudate, fever, lack of cough, tender/enlarged anterior lymph nodes	10 days (5 days if azithromycin used) Consider testing for EBV (EBV serology)
Acute otitis media	<i>Strep. pneumoniae</i> Non-typeable <i>H. influenzae</i> <i>Moraxella catarrhalis</i>	If ear discharge but systemically well and afebrile, treat with topical antibiotics (sofradex or neomycin) for 10 days and consider aural toilet (ENT team to perform). Start oral antibiotics if any of the following criteria are met in a child presenting with AOM (bulging ear drum or discharge):- <ul style="list-style-type: none"> • Pyrexia > 39 C • Moderate to severe otalgia > 2 days • < 2 years old • Purulent discharge from ear canal (not due to otitis externa) and fever • Systemically unwell Consider watchful waiting for children >2 years, those with unilateral disease and without severe symptoms Amoxicillin PO for 5 days if no previous treatment in preceding 4 weeks. If treatment with amoxicillin in preceding 4 weeks, co-amoxiclav PO for 5 days If IV treatment required, for ceftriaxone IV 80mg/kg od [Azithromycin PO for 3 days for penicillin allergy]	5 days (3 days if azithromycin)
Peritonsillar abscess (quinsy)	Group A <i>streptococcus</i> Anaerobes	Ceftriaxone 80mg/kg IV + metronidazole IV / PO	10 days Consider oral switch to co-amoxiclav

<p>Mastoiditis</p>	<p><i>Strep. pneumoniae</i> <i>Moraxella catarrhalis</i> <i>H. influenzae</i>, Group A <i>Streptococcus</i></p> <p>Less common: <i>Staph. aureus</i> occasional anaerobes</p>	<p>Ceftriaxone 80 mg/kg IV + metronidazole (PO or IV)</p>	<p>Total antibiotic course 10 days:- consider early oral switch to Co-amoxiclav</p> <p>If associated sinus venous thrombosis, will require minimum 4 week course of antibiotics – 2 weeks IV followed by 2 weeks oral.</p>
<p>Rhinosinusitis</p>	<p><i>Strep. pneumoniae</i> Non-typeable <i>H.influenzae</i> <i>Moraxella catarrhalis</i> <i>Anaerobes</i></p>	<p>Treat if worsening upper respiratory tract symptoms (fever, daytime cough or nasal discharge) following resolution of viral UTI, severe symptoms (fever >39 degrees, purulent nasal discharge) or persistent symptoms (nasal discharge or daytime cough >10 days)</p> <p>Amoxicillin PO for 7 days if no previous treatment in preceding 4 weeks. If treatment with amoxicillin in preceding 4 weeks, co-amoxiclav po for 7 days</p> <p>[Azithromycin PO for 3 days for penicillin allergy]</p> <p>If severe, may require initial treatment with ceftriaxone 80mg/kg IV prior to oral switch</p>	<p>7 days (3 days if azithromycin used)</p>
<p>Lymphadenitis</p>	<p><i>Staph. aureus</i> Group A <i>streptococcus</i></p>	<p>If mild, cefalexin PO or co-amoxiclav PO</p> <p>If severe, flucloxacillin IV. Consider switch to ceftriaxone 80mg/kg IV for ambulation</p>	<p>7 days</p>

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

GASTROENTEROLOGY SPECIALITY GUIDELINES		
Assess previous microbiology results including multi-resistant bacteria or fungal infections. Contact duty microbiologist if in any doubt.		
Patient group	Most likely causal organisms	First choice
Central Line Infection (suspected or proven)	<p>Gram-positives (including MRSA, coagulase-negative Staph. and enterococci) Gram-negatives (including <i>Pseudomonas aeruginosa</i>)</p>	<p>Vancomycin IV + gentamicin IV once daily</p> <p>Monitor renal function and antibiotic levels.</p>
Sepsis / bacterial translocation in central line / home TPN / immunosuppression	<p>Gram-positives (including MRSA, coagulase-negative Staph and enterococci) Gram-negatives (including enterobacteriaceae and <i>Pseudomonas aeruginosa</i>) Anaerobes Fungal infections such as <i>Candida</i></p>	<p>Assess previous microbiology results and adjust empirical antibiotic choice to reflect known resistance.</p> <p>Vancomycin IV + gentamicin IV once daily + metronidazole IV</p> <p>Consider adding piperacillin/tazobactam IV if likely <i>pseudomonas</i> infection or severe sepsis. Consider empirical caspofungin if severe sepsis (D/W ID / micro team).</p> <p>Monitor renal function and antibiotic levels.</p>
Exacerbation of inflammatory bowel disease	<p>Gram-negatives (including enterobacteriaceae and <i>Pseudomonas aeruginosa</i>) Enterococcus Anaerobes</p>	<p>Ciprofloxacin IV and metronidazole</p>

ONCOLOGY SPECIALITY GUIDELINES

FEBRILE NEUTROPAENIA

REFER TO DETAILED PAEDIATRIC ONCOLOGY GUIDELINES IN ALL CASES

- 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 $0.75 \times 10^9/L$.
- Beware patients in whom ANC $<1.0 \times 10^9/L$ and falling rapidly.

IMPORTANT: Assess previous microbiology and consider previous unusual organisms (e.g. ESBL-producer requiring **meropenem**)

Patient group	Additional notes	Initial treatment [acceptable alternative]
<p>Low risk</p>	<ul style="list-style-type: none"> • ALL maintenance treatment & most patients with solid tumours receiving 3 weekly blocks of chemotherapy <ul style="list-style-type: none"> ◦ 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 <p>If patient has signs of severe sepsis (listed below), add gentamicin as per protocol for standard risk group:</p> <ul style="list-style-type: none"> • desaturation • poor peripheral perfusion • hypotension • altered conscious state 	<p>Piperacillin/tazobactam IV monotherapy provided no severe sepsis.</p> <p>In patients with bone tumours and a prosthesis, add teicoplanin IV if pain or erythema around prosthesis.</p> <p>Continue co-trimoxazole prophylaxis (if taking), but stop ciprofloxacin prophylaxis.</p>
<p>Standard risk</p>	<ul style="list-style-type: none"> • All oncology patients should be considered standard risk unless clearly defined as low risk • Factors increasing risk include:- <ul style="list-style-type: none"> ◦ Expectation to have severe neutropenia ($<0.5 \times 10^9/L$) 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) 	<p>Piperacillin-tazobactam IV + gentamicin IV</p> <p>[Piperacillin-tazobactam IV + ciprofloxacin IV if gentamicin contra-indicated]</p> <p>In patients with bone tumours and a prosthesis, add teicoplanin IV if pain or erythema around prosthesis.</p> <p>Continue co-trimoxazole prophylaxis (if taking), but stop ciprofloxacin prophylaxis.</p>

ANTIBIOTIC DOSING RECOMMENDATIONS		
DRUG	INTRAVENOUS DOSE	ORAL DOSE
Aciclovir (CNS/ severe infection)	<3mths: 20mg/kg IV 8-hourly >3mths-12years: 500mg/m ² IV 8-hourly >12 years: 10mg/kg IV 8-hourly	
Amoxicillin (for Sepsis <3months or suspected Listeria meningitis)	<7days: 60mg/kg IV 12-hourly 7-28 days: 60mg/kg IV 8-hourly >28 days: 60mg/kg IV every 4-6 hours (maximum 2g IV 4-hourly) Increase dose to 100mg/kg (<28 days) if proven Listeria meningitis	<28days: 60mg/kg 8-hourly >28days – 1year: 125mg 8-hourly >1 – 5years: 250mg 8-hourly >5 – 18years: 500mg 8-hourly
Augmentin®	See Co-amoxiclav	
Azithromycin		10mg/kg once daily for 3 days (Max 500mg). For tonsillitis, use 5 day course
Benzylpenicillin	<28 days: 50mg/kg 8 hourly >1 month: 50mg/kg (max 2.4 grams) 6-hourly	
Cefalexin		>1 month – 12 years: 25mg/kg (max. 1g) 8-hourly ≥ 12 years: 1g 8-hourly
Ceftriaxone (if abnormal bilirubin <1month, use Cefotaxime)	<1 month: 50 mg/kg IV once daily >1 month: 80mg/kg (Max. 4g) once daily	
Cefotaxime	<7days: 50mg/kg 12-hourly 7-21days: 50mg/kg 8-hourly >21days: 50mg/kg 8-hourly (6 hourly for meningitis) (maximum 12g per day)	
Cefuroxime	<7 days 50mg/kg IV 12-hourly 7-21 days 50mg/kg IV 8-hourly >21 days – 18years: 50mg/kg (Max. 1.5g) 8-hourly	
Ceftazidime	<7days: 50mg/kg 24-hourly 7-21days: 50mg/kg 12-hourly >21days – 18 years: 50mg/kg 8-hourly (max. 9g daily)	
Chloramphenicol	<14 days: 12.5mg/kg 12-hourly 14-28 days: 12.5mg/kg 6-hourly >28 days: 25mg/kg 6-hourly Reduce dose as soon as indicated to 12.5mg/kg	
Ciprofloxacin	<28 days: 10 mg/kg 12-hourly >1 month: 10 mg/kg (max. 400mg) 8-hourly	<1 month: 15 mg/kg 12-hourly >1 month: 20 mg/kg (max. 750mg) 12-hourly
Clarithromycin	1 month-12 years: 7.5mg/kg (max 500mg) 12-hourly >12 years: 500mg 12-hourly	1month – 12years: 7.5mg/kg 12-hourly 12 – 18 years: 500mg 12-hourly
Clindamycin	1 month – 12 years: 10mg/kg 6-hourly >12 years: 600mg 6-hourly (1.2g 6 – hourly for life-threatening infection)	1 month – 12 years: 6 mg/kg 6-hourly 12-18 years: 450 mg 6-hourly <i>(do not prescribe oral without taste test)</i>

ANTIBIOTIC DOSING RECOMMENDATIONS			
DRUG	INTRAVENOUS DOSE	ORAL DOSE	
Co-amoxiclav	<7 days – 3 months: 30mg/kg 12hourly 3 months – 12 years: 30 mg/kg 8-hourly >12y: 1.2g 8-hourly	Twice-daily dosing Augmentin Duo®	Three-times daily dosing
		<2 years: 0.3mL/kg 2-6 years: 5mL 7-18yrs: 10mL In 12-18 years: can be increased to 10ml 8-hourly in severe infection	<1 month: 0.25 mL/kg 125/31 strength 1 month-6 years: 0.25mL/kg 250/62 strength >6 years: 0.3mL/kg 250/62 strength or 1 tablet (500/125mg)
		Note: doses above may be HALVED for oral treatment of non-severe UTI	
Dexamethasone (for bacterial meningitis)	150 microgram/kg (of dexamethasone phosphate) IV 6-hourly for 4 days (16 doses)		
Flucloxacillin	<7 days: 50mg/kg 12-hourly 7-21 days: 50mg/kg 8-hourly 21-28 days: 50mg/kg 6-hourly 1 month – 18 years: 50mg/kg (max 2g) 6-hourly Osteomyelitis and staphylococcal meningitis – double dose in neonates	<7 days: 25mg/kg 12-hourly 7-21 days: 25mg/kg 8-hourly 21-28 days: 25mg/kg 6-hourly 1 month – 2 years: 125mg 6-hourly 2-10 years: 250mg 6-hourly >10 years: 500mg 6-hourly <i>(do not prescribe oral without taste test)</i>	
Gentamicin (no known renal impairment)	<1 month: 5 mg/kg once daily >1 month: 7mg/kg once daily (Levels before 2 nd dose, then every 3 rd dose, aim for <1 mg/L pre-dose/trough)	Once stable levels and normal renal function, levels can be checked twice per week.	
Metronidazole	<1 month: 15mg/kg loading dose followed after 24 hours by 7.5mg/kg IV 12-hourly 1 month – 18 years: 7.5mg/kg (maximum 500mg) IV 8-hourly	1 month – 12 years: 7.5mg/kg (maximum 400mg) 8-hourly >12 years: 400mg 8-hourly	
Nitrofurantoin		3 months – 12 years: 750 micrograms/kg 6-hourly 12 - 18 years: 50mg 6-hourly (can increase to 100mg 6-hourly in severe chronic recurrent infections)	
Penicillin V		1 month - 1 year: 62.5mg 6-hourly 1 year – 6 years: 125mg 6-hourly 6 years – 12 year: 250mg 6-hourly >12 years: 500mg 6-hourly	
Piperacillin/tazobactam	<1 month: 90mg/kg 8-hourly 1 month – 12 years: 90mg/kg (maximum 4.5g) 8-hourly >12 years: 4.5g 8-hourly Increase dose to 6 hourly in oncology and immunocompromised patients		
Rifampicin	10mg/kg (max 600mg) 12-hourly	10mg/kg (max 600mg) 12-hourly	
Tobramycin	< 1 year: 3mg/kg 8-hourly		

	<p>1 –18 years: 10mg/kg 24-hourly</p> <ul style="list-style-type: none"> Levels should be monitored 6hours before and 1hour after the second dose and again on day 8 	
Vancomycin	<p>Normal renal function: >1 month: 20mg/kg 8-hourly (starting dose)</p>	<p>Ask clinical pharmacist for dose adjustment advice. Once stable levels and normal renal function, levels can be checked twice per week.</p>
	<p>Mild renal impairment: >1 month: 15mg/kg 8-hourly (starting dose)</p>	
	<ul style="list-style-type: none"> Take a trough blood just before the third dose, then give dose Aim for levels of 10-15mg/L (15-20mg/L in MRSA bacteraemia) 	
Vancomycin (intrathecal)	<p>10mg intrathecal every 24 hours (consider reducing to 5mg od if ventricular size reduced or increasing to 15-20mg od if ventricular size increased)</p>	

Penicillin allergy

- 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.

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

Allergy severity	Examples	Antibiotic colour-coding
Severe / Life-threatening	<ul style="list-style-type: none"> • Anaphylaxis or other Type I hypersensitivity reaction • Severe skin reaction (e.g. Stevens Johnson Syndrome) 	<p>RED drugs contra-indicated</p> <p>ORANGE drugs contra-indicated unless no alternative and benefit outweighs risk (seek senior advice)</p> <p>GREEN drugs safe</p>
Non-severe	<ul style="list-style-type: none"> • Mild non-Type I reactions • Mild skin reactions 	<p>RED drugs contra-indicated unless no alternative and benefit outweighs risk</p> <p>ORANGE drugs may be used with caution</p> <p>GREEN drugs safe</p>

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 Colistin Co-trimoxazole Doxycycline Erythromycin Gentamicin Linezolid	Metronidazole Nitrofurantoin Norfloxacin Ofloxacin Rifampicin Sodium fusidate Sulfadiazine Teicoplanin Tetracycline Trimethoprim Tobramycin Vancomycin

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	<ol style="list-style-type: none"> 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