Worcestershire Guidelines For Intravenous Antimicrobial Therapy at Home for Adults

First Edition

JUNE 2011

(Web address)
GUIDELINES FOR INTRAVENOUS ANTIMICROBIAL THERAPY AT HOME

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Jane Stockley, Consultant Microbiologist, WAHT

With grateful acknowledgement to:
Jill Doyle, former Senior IV Therapy Nurse, Worcestershire PCT
Guy Busher, General Practitioner, Malvern Health Centre, Malvern

Review date:    June 2014 or sooner if required. Electronic updates will be issued as required.

Disclaimer:    Whilst every effort has been made to ensure the accuracy of this document, the steering group or any associated NHS Trusts cannot accept responsibility for any errors or omissions in the text. The text is not intended to be totally comprehensive, and the reader should be cognisant of any appropriate drug interactions, adverse effects, contra-indications etc. For antibiotics, as indicated in texts such as the BNF and Summaries of Product Characteristics. The clinician is still required to exercise clinical judgement.

All doses, unless otherwise stated, are for adults. For children’s doses, refer to the BNF for Children
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1. **INTRODUCTION**

Welcome to the first edition of the Guidelines for Intravenous Antimicrobial Therapy at Home. It is available both as a printed version and an electronic version, with useful web addresses.

They have been put together by a multi-disciplinary team of hospital and primary care pharmacists, specialist and community nurses, microbiologists, infectious disease physicians and general practitioners, and give guidance on the indications for, and management of patients receiving intravenous antimicrobial therapy at home. They may be regarded as an Appendix to both the Primary Care antimicrobial Prescribing Guidelines (Fourth edition, January 2011), and also the Worcestershire Hospitals Acute NHS Trust antimicrobial prescribing guidelines. Guidance for prescribing intravenous antibiotics is broadly consistent with that given for hospitalised patients, although occasionally choices of agent and doses may differ slightly to facilitate community administration.

When prescribing, or administering intravenous therapy, healthcare professionals should refer to the BNF, Summary of Product Characteristics (if available) and package inserts for each antibiotic for reconstitution guidance, timing of infusions etc. Wherever possible doses have been selected to enable agents to be given by bolus, but this is not possible in every case. Where necessary, antibiotic levels should be monitored according to Acute Trust protocols (see hospital intranet and summary guidance within these guidelines).

It is intended that the guide is used to promote best practice and equity of practice and patient access across Worcestershire, and is to be updated on a regular basis.

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GUIDELINES FOR INTRAVENOUS ANTIMICROBIAL THERAPY AT HOME

2. SCOPE

This guidance is intended for Worcestershire GPs, Consultants in Acute Trust hospitals, Community Hospital doctors, and as a resource for community nurses who administer I.V. antimicrobial therapy in patients’ homes or other relevant and appropriate clinicians within Worcestershire Acute Hospitals NHS Trust.

3. ROLE OF IV TEAM

The role of the team is to facilitate, and initiate where appropriate, home intravenous administration of antimicrobial agents. The team reserves the right to take advice from the Acute Trust microbiologists and Infectious Diseases Consultants over any patient referred to them.

4. PRINCIPLES OF INTRAVENOUS THERAPY AT HOME

Intravenous Therapy at home may be:

- continuation of therapy initiated within hospital
- advised by a hospital specialist practitioner for a community patient
- initiated by a general practitioner for a patient not requiring or to avoid hospital admission

Always consider whether intravenous therapy is clinically necessary. Many moderate to severe infections can be successfully treated with oral antibiotics, and some agents (e.g. Metronidazole, Clindamycin or ciprofloxacin) have excellent bioavailability, making oral dosing just as effective as intravenous therapy. Intravenous therapy is appropriate whenever

- the patient is unable to tolerate oral therapy
- the severity of infection requires intravenous therapy
- the antibiotic susceptibility pattern of the organism means that oral agents would be inappropriate
- oral antimicrobial therapy has failed
- Gut absorption unreliable or agent not available in an oral form.

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GUIDELINES FOR INTRAVENOUS ANTIMICROBIAL THERAPY AT HOME

a. Suitable conditions for home intravenous therapy

These include

- Urinary Tract Infection caused by organisms resistant to oral agents
- Cellulitis & other soft tissue infection,
- Chest Infections not amenable to oral therapy, or caused by organisms resistant to oral agents
- Patients receiving long-term follow-on therapy after initial hospital investigation & assessment (e.g. Endocarditis, Osteomyelitis etc)

This list is not exhaustive, and may also include patients receiving intravenous anti-fungal agents (e.g. haematology or oncology patients) or antiviral agents.

A wide variety of agents may therefore be used in the community – administration information for all intravenous agents can be found in the University College London NHS Trust (UCL) guide available within the Acute Trust, community hospital wards and home IV team. This guidance does not seek to replicate that information, but more specifically to provide guidance to general practitioners and other primary care professionals following hospital advice, or initiating intravenous therapy themselves for the more commonly encountered conditions.

In all situations, take appropriate samples for culture – swabs, urine, sputum, blood cultures. This is vital to confirm the antibiotic susceptibility pattern, particularly of multi-resistant organisms.

b. Conditions requiring hospital assessment, investigation or samples before starting antibiotics

- Suspected Endocarditis should always be referred for blood cultures, and echocardiography and usually to commence inpatient iv therapy for first 2 weeks
- Suspected meningitis should always be referred for monitoring, CSF examination and blood cultures/PCR investigations
- Peri-orbital Cellulitis
- Pneumonia and complex chest infections

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c. Conditions to be met for prescribing home intravenous therapy

- Patients must be registered with a Worcestershire GP
- Patients must be over 18 years old
- For patients being discharged from the Acute Trust, general medical responsibility must have been agreed by the GP (with cover provided for annual, study or sick leave) with clinical responsibility for the IV antibiotics elements of care retained by the Acute Trust clinician.
- The patient must be medically and psychologically fit, and be able to understand the implications of the treatment at home
- Patients must have a telephone at home to be able to access help
- Patients must not be liable to abuse intravenous access. Current, or recent intra-venous drug users or current alcoholics are excluded
- Patients must have no contraindications in relation to allergies or anaphylaxis
- If blood monitoring is required during treatment, the regime and the responsibility of the assimilation of results must be provided by the referring clinician (See further guidance on page 14)
- There must be a completed medication administration form or electronic discharge prescription.
- For patients discharged from the Acute Trust, all the appropriate medication must be supplied by the Acute Trust.
- The treatment must be appropriate and manageable for the community in terms of drug, dosage, bolus or infusion time, time course of regime.
- The patient must not be pregnant unless prior hospital consultant assessment has taken place, and the drug is licensed/safe in pregnancy. If breast feeding drug to be used must be BNF approved for use in breastfeeding

**ACCEPTANCE OF THE PATIENT WILL DEPEND UPON THE CAPACITY OF THE INTRAVENOUS THERAPY TEAM**

**AND THE AVAILABLE COMPETENCIES OF THE INDIVIDUAL DISTRICT NURSING TEAMS**

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d. Referral pathway for intravenous therapy

GP REFERRAL FOR INTRAVENOUS THERAPY
AT HOME

3 Steps for GP’s

1) Refer to the IV team – check patient suitability according to criteria. Discuss antibiotic regime (unless following specific Cellulitis protocol) with infectious diseases consultant Dr Ling, or in her absence, Dr M Roberts or a Consultant Microbiologist.

2) Prescribe treatment on drug administration sheet. (Document Ref HACWO1) FP10 is not required, provided antibiotic is held in stock by the IV team. Blood monitoring would be required if no recent results available – U&Es, FBC, glucose (good renal function important). The cost of antibiotics is deducted from the GP prescribing budget by NHS Worcestershire.

3) Review patient during the course of treatment then liaise with the Worcestershire Health & Care Trusts’ IV team (IV TEAM).

Contact details: currently available 5 days a week (Mon-Fri), 08.30 till 16.30

Office number: 01905 681818

Pager: 07659 529319

Dr M Ling:
Mon-Fri 09.00-05.30
01905 763333 bleep 136 or 07876508611
Others see page 15

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5. SPECIFIC GUIDANCE

### U.T.I. not suitable for oral therapy

NB: Always send urine for culture before starting antibiotics

<table>
<thead>
<tr>
<th>DEPENDENT ON</th>
<th>OPTIONS INCLUDE:</th>
<th>HELP NOTES:</th>
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<tbody>
<tr>
<td>Urine Culture Results:</td>
<td>Co-amoxiclav 1.2g IV three times daily</td>
<td>a) Keep under review, and consider changing to oral Co-Amoxiclav (625mg tds) as symptoms improve</td>
</tr>
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<td></td>
<td>Review at 48-72 hours, change to oral therapy as symptoms improve</td>
<td>b) Ertapenem may be advised if UTI caused by resistant bacteria, particularly extended-spectrum Beta-lactamase (ESBL) producing coliforms. Length of treatment will depend on whether the patient has simple, uncomplicated UTI (3 days) or complicated, higher UTI (7-10) days.</td>
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<tr>
<td></td>
<td><strong>Or</strong></td>
<td>c) Ertapenem is NOT active against Pseudomonas spp. If this is the causative organism, use Tazocin or equivalent Piperacillin / Tazobactam (2g/0.25g tds)</td>
</tr>
<tr>
<td></td>
<td>Ertapenem*1 g IV once daily</td>
<td>If Penicillin allergy-mild non anaphylactic-Meropenem (500mg tds).Otherwise call for advice. Once daily 5mg/kg Gentamicin may be used with level monitoring see page 14</td>
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<tr>
<td></td>
<td>(mild/moderate* penicillin allergy or resistant organisms)</td>
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<td></td>
<td>– if anaphylaxis with penicillin call Dr Ling or microbiology</td>
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<td></td>
<td>See help notes for duration of course</td>
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</table>
Additional Notes: U.T.I.

**Common Pathogens:** E. coli.  Coliform organisms  Staph. Saprophyticus  Proteus mirabilis

**Clinical Details:**

1. 70-80% of isolates are sensitive to Trimethoprim. Trimethoprim attains higher concentrations for longer periods than Beta-lactam antibiotics, but should not be used for higher UTI (e.g. Pyelonephritis). It can be used during pregnancy except in women who are Folate deficient, or who are taking folate antagonists (unless a Folate supplement is taken). It should not be used if the woman has recently taken Trimethoprim (some clinicians recommend avoiding repeating Trimethoprim within 3 months), or has a history of recurrent infections resistant to this drug.

2. The presence of Proteus may suggest the possibility of renal or bladder calculi. **Discuss with urology if not clearing.** Staph. Aureus may indicate infection in blood or higher in the urinary tract. **Discuss with ID or Microbiologist in all cases**

3. Quinolones e.g. Ciprofloxacin are highly effective but should **never be used routinely** and only with microbiologist advice for complicated infections. Quinolones and Cephalosporins have been highly associated with the incidence of C difficile diarrhoea.

4. ESBL (Extended Spectrum Beta-lactamase) producing organisms are becoming increasingly prevalent in the community. These should be treated according to sensitivity patterns. Nitrofurantoin is often effective, and some are susceptible to Trimethoprim, co-amoxiclav or ciprofloxacin. Occasionally Ertapenem, a once daily parenteral agent is advised. Avoid Nitrofurantoin use in the elderly and in those with renal impairment.

5. Group B Strep bacteriuria reported during pregnancy, treat infection and consider use of peripartum antibiotics.

6. Sterile Pyuria, consider Urethritis (possibly Chlamydia, Vaginal Candida, TB or calculi). **Consider referral to ID if source unclear.**

**Precautions:**

If a patient is catheterised, treatment for an apparent UTI will often fail, and is rarely an appropriate method of treatment unless there are systemic signs e.g. fever, rigors.

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## Cellulitis

<table>
<thead>
<tr>
<th>DEPENDENT ON</th>
<th>OPTIONS INCLUDE:</th>
<th>HELP NOTES:</th>
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</thead>
<tbody>
<tr>
<td>1st line: Optimising oral therapy</td>
<td>See Cellulitis protocol (Appendix A): For most patients, oral therapy should be optimised before escalating to iv therapy</td>
<td>a) Clindamycin has been associated with antibiotic-associated colitis. Treatment should be discontinued immediately if diarrhoea develops</td>
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<tr>
<td></td>
<td>Flucloxacillin 1g qds orally if Penicillin allergy: Clindamicin 450 mg qds orally</td>
<td>b) Peri-orbital cellulitis to be referred because of risk of CNS invasion</td>
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<tr>
<td></td>
<td>Oral Clindamycin may be added to oral Flucloxacillin if poor response</td>
<td>c) If pain is marked feature, then consider necrotising fasciitis, and admit for inpatient treatment</td>
</tr>
<tr>
<td>2nd line:</td>
<td>Teicoplanin 400mg once daily (twice daily on the first day) for 7-10 days</td>
<td>d) Lymphoedema – refer to Primary care Antibiotic Guidelines and specialist Lymphoedema service.</td>
</tr>
<tr>
<td></td>
<td>Oral Clindamycin (450mg four times daily) may be added if poor response (but NB risk of C. difficile disease)</td>
<td>e) Post surgical Cellulitis – take wound swab</td>
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<td></td>
<td></td>
<td>f) Review patient every 48 hours</td>
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<td></td>
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<td>g) If febrile over 38 degrees consider in-patient assessment</td>
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**GUIDELINES FOR INTRAVENOUS ANTIMICROBIAL THERAPY AT HOME**

**Additional Notes: Bacterial Skin Infections - Cellulitis**

**Common Pathogens:**
- Staph. Aureus (including MRSA)
- Pyogenic Streptococci (A, C, G)
- Deep ulcers – anaerobes

**Less common pathogens**
- Coliforms (commensal - rarely pathogenic)
- Pseudomonas aeruginosa (can be a commensal)
- Klebsiella spp. Enterobacter spp.

**Clinical Details:**

**Cellulitis:** (also refer to local dressings, leg ulcer policies and Lymphodema guidelines)

1. **All cases of Cellulitis** should be treated promptly, to reduce the risk of development of septicaemia. In most cases the causative agent is group A beta-haemolytic streptococcus. Secondary infection with *Staph. Aureus* is relatively common, especially in diabetic patients. Cellulitis in special groups such as immunocompromised patients and diabetics may be due to other less common pathogens as well.

2. **H. influenzae cellulitis** is occasionally seen in children, often orbital. Treatment here should be co-amoxiclav (IV Cefotaxime may be necessary). Cellulitis can develop into necrotising infections e.g. anaerobic Cellulitis and gas gangrene. Like rapidly spreading Cellulitis, these are regarded as medical emergencies, and need urgent admission.

3. **Diabetic patients:** Whilst staphylococcal skin infections are common in diabetics, other organisms can often be present. Coliforms (including *E. coli* & *Klebsiella spp.*) and group B streptococci can cause infection in diabetics in areas of ischaemia, trauma or abdominal surgery. Pseudomonas is also an opportunistic pathogen in diabetic skin infections. **For diabetic foot infection,** start treatment with co-amoxiclav 625mg tds for 7 days, with review to consider extension or modification (including possible escalation to IV therapy) of treatment. Also refer to podiatry and establish and manage the underlying cause. Refer to local and NICE guidance on diabetic foot problems.

4. **Leg Ulcers** – Bacteria always present, and antibiotics do not improve healing. Only take swabs if evidence of clinical infection (increased pain or exudates, rapid deterioration). If surrounding Cellulitis, consider co-amoxiclav 625mg tds for 7 days and review.

5. **Necrotic tissue** present may require early debridement and high dose intravenous antibiotics – close review is essential.

6. **Lymphoedema** – seek specialist advice from Lymphoedema service.

7. **Lack of improvement** at 48-72 hours seek ID advice

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Respiratory Tract Infections

L.R.T.I – Community Acquired Pneumonia

If a patient requires IV antibiotics, they MUST be admitted immediately as an emergency. Mortality is high in this group.

COPD

Patients with severe COPD are usually known to the community COPD team. The team is able to obtain Respiratory Consultant Support. Where there is an indication for IV antibiotics in the community, this should only be started where the patient is under the care of the COPD team and following discussion with the Respiratory Consultant.

Bronchiectasis / other Pseudomonas Infection

Bronchiectatic patients with pseudomonas infection should be under the care of the respiratory team. IV antibiotics for ciprofloxacin resistant pseudomonas are not indicated on the basis of microbiological culture alone, and need to be considered in the light of other pseudomonas strategies including prophylactic antibiotics, nebulised antibiotics, physiotherapy and mucolytics. IV antibiotics should be commenced only after discussion with the Respiratory Consultants.

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6. THERAPEUTIC DRUG MONITORING (INCLUDING RENAL FUNCTION)

This will be done by the IV team and is essential for patients receiving Aminoglycosides (Gentamicin or Tobramycin) or Glycopeptides (Vancomycin or Teicoplanin)

Full details may be found on the Trust intranet; the following is a short summary

- **Aminoglycosides – Gentamicin & Tobramycin:**
  1. **Once daily dosing (5mg/kg of lean body weight/day):** Ideally, check level **6-14 hours post first dose**, giving full details of dosage regime, and timing of sample. Level will be checked against the Hartford nomogram, and advice given regarding continuation of this drug regime. **If this timing is not possible, check level immediately before next dose due, this trough level should be <1mg/l.**
  2. **Conventional dosing (typically 80-120mg twice or three times daily):** Take both trough (immediately before dose) and peak (1 hour post-dose) levels. Trough should be <2mg/l, target peak level will depend on condition being treated, and target organism. **Please mark form with condition being treated.** Advice will be given if dosage needs to be changed.

Once established, and stable renal function, Aminoglycoside levels should be checked twice weekly for the duration of therapy.

- **Vancomycin**
  Take trough level (clotted blood sample) immediately before dose due, usually done before third dose. No need to delay giving next dose, but if necessary, further doses will be adjusted according to level. Target trough level does vary according condition being treated and target organism, but level 5-15mg/l is generally regarded as acceptable. No peak level is required.

- **Teicoplanin**
  Take trough level (clotted blood sample → microbiology) immediately before dose due, on day 6 or 7. No need to delay giving next dose or take peak level. Target level 20-60mg/L unless simple Cellulitis when 10-60mg/L adequate. Tests are referred to Bristol and takes 3-4 working days.

7. USEFUL CONTACTS

Further advice regarding antibiotic assays can be found on the Hospital Trust intranet, or from a consultant microbiologist or ID physician.

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### Infectious Disease Physicians:
Dr. M Ling, Worcestershire Royal Hospital 01905 763333 bleep 136 or 07876508611  
Dr. M. Roberts, Kidderminster Hospital 01562 513072 or WRH ext. 53436 or via pager at WRH switchboard

### Respiratory Consultants:
Dr. S. O’Hickey, WRH 01905 760240 (Dr O’Hickey)  
Dr. Vathenan, Alexandra Hospital, Redditch 01527 503881 Bleep via switchboard

### Health Protection Unit:
01562 756300

### Consultant Microbiologists:
<table>
<thead>
<tr>
<th>Name</th>
<th>Hospital</th>
<th>Phone Number</th>
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<tbody>
<tr>
<td>Dr. J. Stockley</td>
<td>Worcestershire Royal Hospital</td>
<td>01905 763333 ext. 39206</td>
</tr>
<tr>
<td>Dr. C. Constantine</td>
<td>Worcestershire Royal Hospital</td>
<td>01905 763333 ext. 39206</td>
</tr>
<tr>
<td>Dr. C Catchpole</td>
<td>Worcestershire Royal Hospital</td>
<td>01905 763333 ext. 39206</td>
</tr>
<tr>
<td>Dr. A Dyas</td>
<td>Alexandra Hospital, Redditch</td>
<td>01527 503030</td>
</tr>
</tbody>
</table>

### Community IV Team: (Worcestershire Health & Care Trust)
Team Leader: Debbie Etherington  
Tel: 01905 681818

### Infection Control:
Worcestershire Health & Care Trust: Community Infection Control Team based at Evesham Community Hospital. Team Leader: Carole Clive. Tel: 01386 502552

### Acute Trust Medicines Information
01905 760611 (direct line) or WRH Ext 30235

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8. REFERENCES

Injectable Medicines Administration Guide, UCL Hospitals Third edition published 2010


MI Database at the Worcester Acute Hospital Trusts

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Patient with Cellulitis seen by doctor/advanced nurse practitioner

Temp under 38 degrees. Well and limb not swollen

Penicillin allergy? NO

Issue Flucloxacillin 1g qds orally 7 days supply

Worse / no better Day 3

Not tolerated

Improving at Day 3

Continue existing treatment to 7 days

Bloods including U&E, Glucose, FBC Urgent BM if Diabetic

Home IV Teicoplanin 400mg IV BD on Day 1 then Daily* 1

Better / no worse Day 3

Not improving or worsening on oral

Penicillin allergy present? YES

Clindamicin 450mg qds orally (600mg qds if weight over 70kg) 2

If worsening cellulitis, no penicillin allergy use with Flucloxacillin, otherwise alone

Notes: Home IV Team TEL: 01905 681818
1. If eGFR under 60, change to Teicoplanin 200mg daily Day 4 onwards
2. No Clindamicin if prior CDT

Exclusions: 1) Infection of hand or involving joints: urgent orthopaedic review/admission
2) Facial/Peri-Orbital Cellulitis: go to hospital - maxillofacial/ENT
3) Suspected Necrotising Fasciitis e.g. moderate/severe pain
4) Rapidly progressive Cellulitis
5) Patient constitutionally unwell e.g. vomiting/temp at/over 39 degrees
6) Major co-morbidity or BM glucose over 28

NB. For 2)-6) – HOSPITAL ADMISSION ADVISED AS EMERGENCY
*Exclusions to Home IV apply including IV Drug User, Alcoholism, Dementia, Mental Health issues, Absence of telephone, Pregnancy

Urgent Infectious Diseases / Microbiology advice bleep 136 at WRH/ or admit - (Ceftriaxone 1-2g IV daily for Home IV may be advised)
## IV INJECTIONS for Adults - For Administration in the Community / Community Hospitals

It is a medical responsibility to ensure that the prescribed dose is appropriate for the patient's renal and liver function.

Nurses – For convenience, wherever possible the administration method shown here is IV bolus (except Gentamicin, Vancomycin, Ertapenem and 2g Ceftriaxone, high dose Teicoplanin). Please use this method unless an infusion is necessary, or as indicated in the method and administration.

If using a part vial, please contact Medicines Information for further advice on displacement values.

<table>
<thead>
<tr>
<th>DRUG</th>
<th>PRESENTATION</th>
<th>METHOD &amp; ADMINISTRATION</th>
<th>ADVERSE REACTIONS/MONITORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMOXICILLIN</td>
<td>Powder for reconstitution 250 or 500mg vials</td>
<td>Dissolve with water for injection, 5ml for 250mg, 10ml for 500mg. Administer immediately after reconstitution as a bolus over 3-4 minutes. (1g doses will be 20ml over 3-5 minutes. 2g doses will be 40ml over 6-10 minutes, or if impractical, dilute up to 100ml sodium chloride 0.9% over 30 minutes)</td>
<td>Anaphylactic reactions have been reported rarely. Discontinue if an itch or wheezing develops, a rash appears, or if there are any signs of collapse.</td>
</tr>
<tr>
<td>BENZYL PENICILLIN</td>
<td>Powder for reconstitution 600mg, 1.2g</td>
<td>Dissolve with water for injection (10ml per 600mg). Administer at a rate of at least 1 minute per 300mg.</td>
<td>Occasionally hypersensitivity to penicillin in the form of a rash. Anaphylactic reactions have been reported rarely - see amoxicillin.</td>
</tr>
<tr>
<td>CEFOTAXIME</td>
<td>500mg, 1g &amp; 2g powder</td>
<td>Dissolve in water for injection: (250mg and 500mg in 2ml; 1g in 4ml; 2g in 10ml). Can be given as a bolus over 3-5 minutes.</td>
<td>Diarrhoea and rarely pseudomembranous colitis or allergic reaction. Anaphylactic reactions have been reported rarely – see amoxicillin.</td>
</tr>
<tr>
<td>CEFTRAZIDIME</td>
<td>Powder for reconstitution 250mg, 500mg, 1g and 2g vials</td>
<td>Dissolve with water for injection or sodium chloride 0.9% (250mg in 2.5ml, 500mg in 5ml and 1 and 2g in 10ml). Administer slowly over 3-5 minutes. <strong>Doses over 2g should be further diluted with 50-100ml sodium chloride 0.9% or glucose 5% and given over 20-30 minutes.</strong> NB. As the antibiotic dissolves, carbon dioxide is released causing frothing which clears quickly. Any small bubbles remaining in syringe are carbon dioxide and can be injected without ill effects.</td>
<td>Phlebitis, thrombophlebitis and hypersensitivity reactions are rare. Anaphylactic reactions have been reported rarely - see amoxicillin. Reduced dose in renal impairment. MONITORING With high doses (greater than 4g daily) and concurrent aminoglycosides (Gentamicin or Tobramycin) or potent diuretics such as Frusemide, renal function may be adversely affected: check U &amp; Es 2-3 days after discharge.</td>
</tr>
<tr>
<td>DRUG</td>
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<tr>
<td>CEFTRIAXONE</td>
<td>Powder for reconstitution</td>
<td>Reconstitute with water for injection, 5ml for 250mg, 10ml for 1g. Give by slow intravenous bolus over 2-4 minutes, or via drip tubing. 2g should be reconstituted with 50ml -100ml glucose 5% or sodium chloride 0.9% and infused over at least 30 minutes.</td>
<td>Care required in patients who have previously shown hypersensitivity (especially anaphylactic reaction) to Penicillins or other non-cephalosporin beta-lactam antibiotics. Avoid if both renal AND liver impairment, or in patients with cholestatic jaundice</td>
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<tr>
<td></td>
<td>250mg, 1g &amp; 2g</td>
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<tr>
<td>CO-AMOXICLAV</td>
<td>Powder for reconstitution</td>
<td>Reconstitute with water for injection, 10ml for 600mg, 20ml for 1.2g. Give as bolus over 3-4 minutes.</td>
<td>Occasionally hypersensitivity to penicillin in the form of a rash. Anaphylactic reactions have been reported rarely - see amoxicillin. Dose reduce in renal impairment</td>
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<td></td>
<td>600mg and 1.2g</td>
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<td>ERTAPENEM</td>
<td>Powder for reconstitution</td>
<td>Reconstitute 1g with 10ml water for injection or sodium chloride 0.9%  Shake well to dissolve. Add to 50ml sodium chloride 0.9% and give over 30 minutes.</td>
<td>Most common side effects are: Headache. Diarrhoea. Nausea, vomiting. Rash, itching. Inflammation, formation of a lump, swelling at the injection site. Rarely: allergic reactions Very rarely: Anaphylaxis. Hallucinations. Reduce dose in renal impairment</td>
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<td>1g vial</td>
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<tr>
<td>FLUCLOXACILLIN</td>
<td>Powder for reconstitution</td>
<td>Dissolve with water for injection, 5ml for 250mg, 10ml for 500mg. Give as an intravenous bolus over 3-4 minutes within 30 minutes of reconstituting. Doses over 1g doses will be diluted with 50-100ml sodium chloride 0.9% and given over 30-60 minutes.</td>
<td>Anaphylactic reactions have been reported rarely - see amoxicillin. Avoid in liver impairment. CSM advise that cholestatic jaundice may occur up to several weeks after stopping treatment. Courses longer than two weeks and elderly patients at most risk.</td>
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<td></td>
<td>250/500mg vials</td>
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<td>GENTAMICIN</td>
<td>Multi dose vials 80mg in 2mls</td>
<td>For extended interval dosing, dilute the prescribed dose in 100ml 0.9% sodium chloride and give over 60 minutes. Multiple dosing, up to 120mg a dose, these doses may be given as a slow bolus over 3-5 minutes.</td>
<td>Ototoxicity and nephrotoxicity can occur so serum levels should be monitored, especially in renal impairment. Nausea, vomiting and urticaria can be seen.</td>
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<td>MONITORING</td>
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<td>For extended interval dosing, check level 6-14 hours after the start of the first infusion., or alternatively immediately before dose is due. (Important - Record the infusion start time and the sample time precisely) and, similarly, twice a week thereafter, provided renal function remains stable. Check U &amp; Es at same time. Do not omit doses while results awaited (unless side effects apparent – seek advice) More frequent monitoring is needed where renal function is unstable.** Microbiology advice should be obtained for courses longer than 7 days.</td>
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<td>If patients have a Creatinine clearance less than 40ml/min, extended interval dosing is contra-indicated.</td>
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<td>TAZOCIN equivalent</td>
<td>Powder for reconstitution</td>
<td>Reconstitute with either water for injection or saline (10ml for 2.25g or 20ml for 4.5g). Swirl (DO NOT SHAKE) until dissolved. Given by slow intravenous bolus over 3-5 minutes.</td>
<td>Serious and occasional fatal anaphylactic reactions have been reported in patients receiving therapy with Penicillins. Reduced dose in renal impairment.</td>
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<td>2.25g (2g/0.25g) &amp; 4.5g</td>
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<td>(4g/ 0.5g)</td>
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<tr>
<td>DRUG</td>
<td>PRESENTATION</td>
<td>METHOD &amp; ADMINISTRATION</td>
<td>ADVERSE REACTIONS/MONITORING</td>
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<tr>
<td>TEICOPLANIN</td>
<td>Powder for reconstitution 200mg &amp; 400mg 600mg - 6mls WFI given in 100ml sodium chloride over 30 minutes 800mg upwards – 6mls + WFI given in 100ml sodium chloride over 60 minutes</td>
<td>Reconstitute each 200mg vial with 3ml water for injection supplied. Give 3ml. Reconstitute each 400mg vial with 3ml water for injection supplied. Give 3ml. DO NOT SHAKE. Give by slow intravenous bolus over 3-5 minutes.</td>
<td>Caution in patients known to be hypersensitive to Vancomycin, since cross hypersensitivity may occur. Reduced dose in renal impairment. Check U &amp; Es 2-3 days after discharge if patient has pre-existing renal impairment. Teicoplanin levels required - dependant on the consultants requirements</td>
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<td>VANCOMYCIN</td>
<td>Powder for reconstitution 1g vial</td>
<td>Reconstitute 1g vial with 20ml water for injections. Add resulting solution to 250ml of sodium chloride 0.9% or glucose 5% Maximum infusion rate = 10mg per minute (approx 2 hours for 1g dose) to avoid rapid infusion-related reactions</td>
<td>Anaphylaxis, ototoxicity, nephrotoxicity. Monitor drug levels and renal function. Reduce dose in renal impairment. MONITORING Twice daily administration - check the pre-infusion level prior to the 3rd or 4th dose and twice a week thereafter. Check U &amp; Es at same time. Do not omit doses while results awaited (unless side effects apparent – seek advice.) Earlier and more frequent monitoring is needed in once daily administration and/or changing renal function.** Microbiology advice should be obtained for courses longer than 7 days.</td>
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