Livewell Southwest

Acute Care at Home Intravenous Medication Policy and Protocols

Version No 1.
Review: June 2019

Notice to staff using a paper copy of this guidance

The policies and procedures page of Intranet holds the most recent version of this guidance. Staff must ensure they are using the most recent guidance.

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Associated documentation	Safe and Secure Handling of Medicines v6.3 Procedures for Administering Injectable Drugs v4.0 Antimicrobial Treatment Guidelines v4.2
Supersedes document	- Ceftazidime 1g and 2g IV Bolus injection for Registered Healthcare Professionals to Acute Care at Home patients v1 - Ceftriaxone 1g and 2g IV injection/infusion for Registered Healthcare Professionals to Acute Care at Home patients v1 - Ertapenem 1g Infusion for Registered Healthcare Professionals to Acute Care at Home patients v1 - Meropenem 1g injection/Infusion for Registered Healthcare Professionals to Acute Care at Home patients v1 - Piperacillin/Tazobactam 4.5g IV Infusion for Registered Healthcare Professionals to Acute Care at Home patients v1
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Document review history

Version no.	Type of change	Date	Originator of change	Description of change
0.1	New document	March 2016	Advanced Specialist Clinical Pharmacist	New document
0.2	Amendments following consultation	April 2016	Advanced Specialist Clinical Pharmacist	Amendments following consultation
1.0	Ratified	May 2016	Chief Pharmacist	Following MGG May 2016

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Acute Care at Home Intravenous Medication Policy

1 Introduction

1.1 The Acute Care at Home team is a community based service providing Intravenous medication to patients in their own home. This document ensures that interventions are used appropriately including administration that is suitable for community practice.

2 Purpose

2.1 The purpose of this document is to ensure that intravenous medication is used for the appropriate indications following recognised practice including administration that is appropriate for the community. The document outlines general principles as well as specific clinical and administration information for each intervention that the Acute Care at Home team can administer.

2.2 The objectives of this policy are to ensure that:

- Intravenous medication is used for appropriate indications within recognised general practice and that interventions are clinically appropriate for each individual patient.
- Patients are appropriately monitored and reviewed for potential adverse effects and clinical response.
- Medication is supplied and administered in accordance with a valid prescription.

3 Definitions

Abbreviation / term	Definition
AC@H	Acute Care at Home
IV	Intravenous
BNF	British National Formulary
SPC	Summary of Product Characteristics (www.medicines.org.uk)
WFI	Water for Injection
PHNT	Plymouth Hospitals NHS Trust
Robin CAH	Robin Community Assessment Hub
PGD	Patient group direction
LFT	Liver function test
CRP	C- reactive protein
U&E	Urea and electrolytes
WCC	White cell count
INR	International Normalised Ratio

4 Duties & responsibilities

4.1 The **Chief Executive** is ultimately responsible for the content of all policies, implementation and review.

4.2 Responsibility of **Line managers**

- Ensuring all staff have appropriate induction to this and other relevant policies.
- Ensuring all staff attend any relevant training and demonstrate and maintain competencies as appropriate.
- Responding to incident forms relating to medication administration by the AC@H team.

4.3 Responsibility of all **staff**

- Follow the requirements of this policy and keep up to date with any amendments.
- Practise within their professional limits.
- Complete incident forms in the event that this is needed.

4.4 Responsibilities of **Registered Nurses** within the AC@H team

- Take referrals following the guidance within the policy.
- Administer medicines following the guidance within each appendix.
- Complete necessary monitoring in line with guidance from the appendix and follow up results with the responsible clinician with support from the AC@H pharmacist.

4.5 Responsibilities of AC@H **pharmacists**

- Support AC@H nurses to ensure referrals are appropriate.
- Ensure appropriate monitoring is completed and where necessary liaise with referring clinicians following results alongside the nursing staff.
- Provide additional clinical advice on interventions as necessary.
- Review and update the policy as required.

5 Medication Policy

5.1 Client Group and Referrals

5.1.1 Intravenous medication is indicated in the following situations:

- The patient has had a poor response to first line oral medication (e.g. antimicrobials)
- The patient is unable to take medication orally (e.g. due to emesis, poor oral intake)
- The intervention is only available via the intravenous route

5.1.2 In order to ensure interventions are appropriate for community administration the AC@H service will only routinely administer medication listed within the appendices of this policy.

5.1.3 This includes medicines which are given over a short administration time (IV bolus or short IV infusions e.g. 30 minutes), do not require additional monitoring during/after administration (e.g. delayed infusion reactions) or do not require additional training competencies in order to be administered (e.g. cytotoxic medicines).

5.1.4 Referrals for interventions not listed within this policy may be accepted following approval by the senior AC@H pharmacist only. This request will be considered in

the context of the individual patient and following discussion with the appropriate specialist.

5.1.5 If there is no AC@H pharmacist available the referral cannot be accepted and the referring clinician should consider alternative options (e.g. change in therapy, inpatient admission) discussing with an appropriate specialist if necessary (e.g. consultant microbiologist). This is to ensure referrals are appropriate.

5.1.6 Where the AC@H pharmacist has approved use of additional interventions clinical guidance will be supplied to support the referral using the blank template in Appendix B. This will be specific for this referral, if future referrals for the same intervention are received the process should be repeated.

5.1.7 Details of the interventions AC@H can routinely administer are listed in Appendix A of this policy which includes clinical indications, contra-indications, cautions and significant drug interactions as well as additional advice around adverse effects, monitoring requirements and administration. Staff should consult current BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist.

5.1.8 At the point of referral AC@H staff should confirm the patient's relevant medical history, known current medication and allergy status to ensure the intervention is clinically appropriate. This will later be followed up in depth by the AC@H pharmacist.

5.1.9 If any contra-indications are identified the referral cannot be accepted and alternative options should be considered by the prescriber.

5.1.10 Any identified cautions or significant drug interactions should be discussed with the prescriber (and if available the AC@H Pharmacist) to confirm if the treatment is still appropriate.

5.1.11 Interventions should be used within the guidance listed in each appendix in particular the indication and dose range. Practice should only fall outside of this following appropriate specialist advice (e.g. for antimicrobials following advice from a microbiology consultant) and rationale should be documented in the patient's notes.

5.1.12 Allergy status should be confirmed at point of referral including what reaction the patient had. Staff should confirm there is no risk of cross-reactivity between any allergens and the proposed intervention.

5.1.13 For penicillin and related antibiotics the following is advised:

- Patients with a history of type 1 hypersensitivity reaction (urticaria, angioedema, anaphylaxis) or Stephens-Johnson syndrome precipitated by beta lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam) should avoid all of these antibiotics. In cases where such agents are essential and no alternative exists contact a consultant Microbiologist or Immunologist to discuss.
- Patients with non-urticarial rash allergies to penicillins may receive a cephalosporin in a controlled environment. The risk of subsequent rash allergy to a cephalosporin is likely to be less than 5%. The risk of anaphylaxis to cephalosporins remains small but staff should be prepared for such reactions. The risk of allergy to carbapenems (meropenem/ertapenem) and aztreonam in individuals with a rash allergy to penicillins is small.

- Where there is a documented allergy to non-penicillin beta lactams (cephalosporins, carbapenems, aztreonam) the risk of cross-reactions with related antibiotics (see BNF for groupings of antibiotics) needs to be discussed with the on call Microbiologist.

5.1.14 For patients with known renal or hepatic dysfunction the need for dose reductions or additional monitoring should be confirmed with the information in the specific intervention's appendix. If reductions have not been made then this should be highlighted to the prescriber before proceeding with further treatment.

5.2 Prescribing, monitoring and review of medicines.

5.2.1 The overall responsibility for prescribing remains with the referring clinician. This includes:
- Ensuring an appropriate prescription is supplied
- Interpreting any additional monitoring performed
- Ensuring the patient is appropriately reviewed if necessary

5.2.2 All patients must have a valid prescription chart completed by the prescriber to document administration. This can be an inpatient or community prescription chart. If referred from an acute hospital (e.g. PHNT) their standard inpatient prescription chart can also be used initially.

5.2.3 Where possible the prescription should include any diluents or flushes however if omitted these can also be administered using a patient group direction (see specific patient group directions for more details).

5.2.4 In addition to a prescription chart the prescriber must also arrange a supply of the IV medication and any additional diluents or flushes as needed.

5.2.4.1 For patients discharged from an inpatient hospital this should be supplied through the hospital's pharmacy department.

5.2.4.2 For patients started on treatment in the community the items should be prescribed on an FP10 prescription which will be taken to a community pharmacy.

5.2.5 All patients will have a full set of clinical observations taken at every visit. Additional monitoring can be requested by the prescriber which may include:
- Therapeutic drug monitoring (e.g. for aminoglycosides)
- Clinical response (e.g. CRP, WCC, U+Es)
- Any additional markers (e.g. renal function, INR)

5.2.6 When agreeing to completing additional monitoring staff should confirm the monitoring frequency, expected range (e.g. for therapeutic drug monitoring) and action to take if abnormal results are identified.

5.2.7 An appropriate plan should be in place to review each patient at the end of their treatment and if necessary during their treatment. The referring clinician should also indicate who to contact should the patient show signs of deterioration.

5.3 Administration Supply and Monitoring.

5.3.1 All medication and any sundries required by the team should be supplied by the referring clinician. For community patients this should be via an FP10 prescription and for hospital patients this should be via their pharmacy department.

5.3.2 If it is not possible to gain an immediate supply via FP10 (e.g. during weekends, medicines which need to be ordered) then a temporary supply can be obtained from stock supplies. Quantities obtained on FP10 should be amended to reflect this to reduce wastage.

5.3.3 Unused medication should be disposed of according to the organisation's waste disposal policy but where possible patients should be encouraged to take their waste to their own community pharmacy.

5.3.4 As in 5.2.2 all medication must be administered in accordance with a valid prescription chart. The method of administration including reconstitution is outlined within the appendices of this policy in addition to the organisation's IV monograph. Any requests to administer medication via alternative routes should be discussed with the AC@H pharmacist and the rationale should be documented in the clinical notes.

5.3.5 Administration of antimicrobials should be timed to ensure that sufficient space is given between doses to ensure maximum efficiency.

5.3.5.1 Capacity to ensure this should be factored in when taking referrals.

5.3.5.2 Where interventions will be administered at closer intervals than usual practice (e.g. 6 hours between three times a day visits with a longer period overnight) this should be highlighted to the responsible clinician at the point of referral as a potential clinical risk.

5.3.6 Administration should be documented on the prescription chart in addition to completing the relevant IV care plans on SystmOne.

6 Training implications

6.1 All members of AC@H staff administering medicines must complete training and competency assessments in drug administration including IV medicines. This can be provided by the Professional Training and Pharmacy departments.

7 Monitoring compliance

Compliance to this policy will be intermittently evaluated by the AC@H pharmacist in discussion with the AC@H manager by retrospectively reviewing a random sample of patients.

All policies are required to be electronically signed by the Lead Director. Proof of the electronic signature is stored in the policies database.

The Lead Director approves this document and any attached appendices. For operational policies this will be the Locality Manager.

The Executive signature is subject to the understanding that the policy owner has followed the organisation process for policy Ratification.

Signed: Dr Adam Morris, Medical Director
Date: 14/06/16

Appendix A –Interventions approved for administration by Acute Care at Home staff

Appendix 1 – Amoxicillin Intravenous Injection	
Indications	Susceptible infections (including urinary-tract infections, otitis media, sinusitis, uncomplicated community acquired pneumonia, salmonellosis, oral infections).
Contra-indications	Previous allergy to amoxicillin, any other penicillins or any other ingredients in amoxicillin injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam).
Cautions	Acute and chronic lymphocytic leukaemia, cytomegalovirus infection, glandular fever (erythematous rashes common), dehydration (accumulation of sodium can occur with high parenteral doses).
Significant Interactions	- Coumarin anticoagulants – INR may be altered, requires additional monitoring (see below). - Methotrexate – may increase risk of methotrexate toxicity, referrer to consider alternative antibiotics or monitor for signs of toxicity (dyspnoea, cough or fever, stomatitis, abnormal FBCs, abnormal LFTS).
Usual dose range	500 mg three times a day. N.B. higher dosing ranges are available but are usually prescribed more frequently than three times a day– refer to BNF or discuss with microbiology if dose differs from above.
Renal and hepatic impairment	<u>Renal Impairment</u> - GFR > 10ml/min: Dose as in normal renal function - GFR < 10ml/min: 250 mg – 1 g three times a day <u>Hepatic Impairment</u> No additional precautions
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Maculopapular rash or exanthema, pruritus, urticaria, oedema, shivering and anaphylactic or anaphylactoid reactions (e.g. bronchospasm) and allergic dermatitis have occurred. Other common side effects include diarrhea, nausea, vomiting, fever, joint pains, serum sickness-like reaction. Additional side effects that are rare/unknown frequency include antibiotic-associated colitis, cerebral irritation, CNS toxicity (including convulsions), coagulation disorders, encephalopathy, haemolytic anaemia, interstitial nephritis, leucopenia, thrombocytopenia.

Administration	250mg dose	Reconstitute 250mg vial with 5ml WFI. Administer as an IV bolus over 3 - 4 minutes.
	500mg dose	Reconstitute 500mg vial with 10ml WFI. Administer as an IV bolus over 3 - 4 minutes.
	1g dose	Reconstitute 1g vial with 20ml WFI. Administer as an IV bolus over 3 - 4 minutes.
	2g dose	Reconstitute 1g vials with 20ml WFI per vial. Dilute with sodium chloride 0.9% or glucose 5% to 100ml and administer as an IV infusion over 30 minutes using either gravity infusion or an infusion pump suitable for community use.
	Displacement values vary - consult individual product for details.	
Monitoring requirements	- For those taking coumarin anticoagulants increase the frequency of INR monitoring. - For those taking methotrexate consider monitoring FBCs and LFTs. - Inflammatory markers and U&E's as indicated by clinical presentation.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 2 – Ceftazidime Intravenous Injection	
Indications	Susceptible infections due to sensitive Gram-positive and Gram-negative bacteria including pseudomonal lung infection in cystic fibrosis, complicated urinary-tract infection, septicaemia, hospital-acquired pneumonia, meningitis. Only use following advice from consultant microbiologist or relevant specialist.
Contra-indications	Previous allergy to ceftazidime, any other cephalosporins or any other ingredients in ceftazidime injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam).
Cautions	Previous ESBL infection (increased susceptibility) Renal impairment (see dose reductions)
Significant Interactions	- Coumarin anticoagulants – INR may be altered, requires additional monitoring (see below).
Usual dose range	1-2g two to three times a day. Maximum 3g per day in patients aged 80 years and over. (For pseudomonal lung infections in cystic fibrosis: 100–150 mg/kg daily in 3 divided doses. Maximum 9 g per day).
Renal and hepatic impairment	<u>Renal Impairment:</u> - GFR 31–50ml/min: 1–2 g twice a day - GFR 16–30 ml/min: 1–2 g once daily - GFR 6–15 ml/min: 500 mg – 1 g once daily - GFR <5 ml/min: 500 mg – 1 g every 48 hours <u>Hepatic Impairment:</u> Use caution in severe hepatic impairment
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Maculopapular rash or exanthema, pruritus, urticaria, oedema, shivering and anaphylactic or anaphylactoid reactions (e.g. bronchospasm) and allergic dermatitis have occurred. Additional side effects that are rare/have an unknown frequency include antibiotic-associated colitis, abdominal discomfort, agranulocytosis, aplastic anaemia, blood disorders, confusion, diarrhoea, disturbances in liver enzymes, dizziness, eosinophilia, haemolytic anaemia, hallucinations, headache, hyperactivity, hypertonia, leucopenia, nausea, nervousness, reversible interstitial nephritis, serum sickness-like reactions with rashes, fever and arthralgia, sleep disturbances, Stevens-Johnson syndrome, thrombocytopenia, toxic epidermal necrolysis, transient cholestatic jaundice, transient hepatitis, vomiting, paraesthesia, taste disturbances.

Administration	500mg dose	Reconstitute 500mg vial with 5ml sodium chloride 0.9% or glucose 5%. Administer as an IV bolus over 3-5 minutes.
	1g dose	Reconstitute 1g vial with 10ml sodium chloride 0.9% or glucose 5%. Administer as an IV bolus over 3-5 minutes
	2g dose	Reconstitute 2g vial with 10ml sodium chloride 0.9% or glucose 5%. Administer as an IV bolus over 3-5 minutes.
	A 3g dose (1x1g +1x2g vials) may be given by slow IV bolus. Displacement values vary - consult individual product for details.	
Monitoring requirements	- For those taking coumarin anticoagulants increase the frequency of INR monitoring. - Inflammatory markers and U&E's as indicated by clinical presentation.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 3 - Ceftriaxone	
Indications	Susceptible infections due to sensitive Gram-positive and Gram-negative bacteria. Uncomplicated gonorrhoea, pelvic inflammatory disease, early syphilis. Endocarditis caused by 'HACEK organisms' (in combination with another antibacterial).
Contra-indications	Previous allergy to ceftriaxone, any other cephalosporins or any other ingredients in ceftriaxone injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam). Concomitant treatment with intravenous calcium. Hypoalbuminaemia, acidosis, unconjugated hyperbilirubinaemia.
Cautions	Dehydration (risk of precipitation in gall bladder), may displace bilirubin from serum albumin, treatment longer than 14 days. N.B. not licensed for treatment of some conditions but recognised practice (see current edition of BNF for further info).
Significant Interactions	- Coumarin anticoagulants – INR may be altered, requires additional monitoring (see below). - Patients also receiving TPN or other infusions containing calcium (even if via different line). Referrer to consider alternative antimicrobial.
Usual dose range	1-2g daily (can be increased up to 4 g daily in severe infections on consultant microbiology advice only).
Renal and hepatic impairment	<u>Renal impairment:</u> - eGFR>10ml/min/1.73m^2: Dose as in normal renal function - eGFR<10ml/min/1.73m^2: Consider dose reductions - maximum 2g daily <u>Hepatic impairment:</u> Reduce dose if renal and hepatic failure.
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Maculopapular rash or exanthema, pruritus, urticaria, oedema, shivering and anaphylactic or anaphylactoid reactions (e.g. bronchospasm) and allergic dermatitis have occurred. Other common side effects include Calcium-ceftriaxone precipitation in gall bladder or urine (particularly in very young, dehydrated or those who are immobilized). Additional side effects that are rare/unknown frequency include antibiotic-associated colitis, abdominal discomfort, agranulocytosis, aplastic anaemia, blood disorders, confusion, diarrhoea, disturbances in liver enzymes, dizziness, eosinophilia, haemolytic anaemia, hallucinations, headache, hyperactivity, hypertonia, leucopenia, nausea, nervousness, reversible interstitial nephritis, serum sickness-like reactions with rashes, fever and arthralgia, sleep disturbances, Stevens-Johnson syndrome, thrombocytopenia, toxic epidermal necrolysis, transient cholestatic jaundice, transient hepatitis, vomiting, pancreatitis, prolongation of prothrombin time.

Administration	1g dose	Reconstitute 1g vial with 10ml WFI Administer as an IV bolus over 2-4 minutes
	2g dose	Reconstitute 2g vial with 40ml sodium chloride 0.9% or glucose 5% Administer as an IV infusion over 30 minutes using either gravity infusion or an infusion pump suitable for community use
	Displacement values vary - consult individual product for details. Do not administer with TPN or fluids containing calcium even if by different infusion lines.	
Monitoring requirements	- For those taking coumarin anticoagulants increase the frequency of INR monitoring. - Inflammatory markers and U&E's as indicated by clinical presentation.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 4 – Co-amoxiclav		
Indications	Infections due to beta-lactamase-producing strains (where amoxicillin alone not appropriate) including respiratory tract infections, bone and joint infections, genito-urinary and abdominal infections, cellulitis and animal bites.	
Contra-indications	Previous allergy to co-amoxiclav, any other penicillins or any other ingredients of co-amoxiclav injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam). History of penicillin associated jaundice or hepatic dysfunction.	
Cautions	Acute and chronic lymphocytic leukaemia, cytomegalovirus infection, glandular fever.	
Significant Interactions	- Coumarin anticoagulants – INR may be altered, requires additional monitoring (see below). - Methotrexate – may increase risk of methotrexate toxicity, referrer to consider alternative antibiotics or monitor for signs of toxicity (dyspnoea, cough or fever, stomatitis, abnormal FBCs, abnormal LFTS).	
Usual dose range	1.2 g three times a day.	
Renal and hepatic impairment	<u>Renal Impairment:</u> - eGFR 10–30 mL/min/$1.73m^2$: Give 1.2 g initially, then 600 mg twice daily - eGFR <10 mL/min/$1.73m^2$: Give 1.2 g initially, then 600 mg daily <u>Hepatic Impairment:</u> Monitor LFTs if known liver disease. No dose reductions required.	
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Maculopapular rash or exanthema, pruritus, urticaria, oedema, shivering and anaphylactic or anaphylactoid reactions (e.g. bronchospasm) and allergic dermatitis have occurred. Other common side effects include cholestatic jaundice, hepatitis, nausea, vomiting. Additional side effects that are rare/unknown frequency include dizziness, headache, prolongation of bleeding time, phlebitis at injection site, exfoliative dermatitis, Steven-Johnson syndrome, toxic epidermal necrolysis and vasculitis.	
Administration	1.2g dose	Reconstitute 1.2g vial with 20ml WFI. Administer as an IV bolus over 3-4 minutes.
	600mg dose	Reconstitute 600mg vial with10ml WFI. Administer as an IV bolus over 3-4 minutes.
	Displacement values vary - consult individual product for details.	
Monitoring requirements	- For those taking coumarin anticoagulants increase the frequency of INR monitoring. - For those taking methotrexate consider monitoring FBCs and LFTs. - For those with known liver disease – monitor LFTs. - Inflammatory markers and U&E's as indicated by clinical presentation.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 5 – Cyclizine	
Indications	Severe nausea and vomiting limiting ability to absorb oral anti-emetics
Contra-indications	Previous allergy to cyclizine or any other ingredients in cyclizine injection. Acute porphyrias Short term use only – review as soon as able to tolerate oral medication.
Cautions	Epilepsy, neuromuscular disorders, prostatic hypertrophy, pyloroduodenal obstruction, severe heart failure, mean arterial pressure and pulmonary wedge pressure, susceptibility to angle-closure glaucoma, urinary retention. There have been anecdotal reports of cyclizine abuse due to euphoric or hallucinatory effects (worsened when taken with opiates or alcohol). Use in caution in patients with history/risk of substance dependence.
Significant Interactions	- Opioid analgesics or alcohol - increased risk of sedation (monitor closely or referrer to consider alternative anti-emetic). Withhold doses if acutely intoxicated.
Usual dose range	50 mg up to 3 times a day Short term use only – review as soon as able to tolerate oral medication.
Renal and hepatic impairment	<u>Renal impairment:</u> No dosing reductions required in renal impairment <u>Hepatic impairment:</u> Avoid in severe liver disease—increased risk of coma
Side effects	Drowsiness is common. Additional side effects that are rare/unknown frequency include anaphylaxis, angioedema, angle-closure glaucoma, arrhythmias, blood disorders, bronchospasm, confusion, convulsions, depression, dizziness, extrapyramidal effects, hypersensitivity reactions, hypotension, liver dysfunction, palpitation, paradoxical stimulation (especially with high doses in the elderly), photosensitivity reactions, rashes, sleep disturbances, tremor, transient paralysis, antimuscarinic effects, blurred vision, dry mouth, gastro-intestinal disturbances, hallucinations, headache, hypertension, movement disorders, oculogyric crisis, paraesthesia, psychomotor impairment, tachycardia, transient speech disorders, twitching, urinary retention.
Administration	Administer as an IV bolus over 3-5 minutes. Can be diluted to a more convenient volume (use immediately) with sodium chloride 0.9% or glucose 5% or administered undiluted. (Administering a diluted volume as a slower bolus may reduce the ‘rush’ described by some patients, consider in patients where dependence may be a risk). If diluted with sodium chloride 0.9%, visually check the dilution for any crystallization, precipitation or haziness.
Monitoring requirements	- If significant vomiting consider need to monitor U+E’s and renal function in case of dehydration.
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.	

Appendix 6 – Ertapenem	
Indications	Urinary tract infections with history/risk of ESBL infection. Can only be used following advice from consultant microbiologists as prolonged/repeated use poses risk of resistant infections.
Contra-indications	Previous allergy to ertapenem, any other carbapenems or any other ingredients in ertapenem injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam).
Cautions	CNS disorders (risk of seizures), elderly.
Significant Interactions	- Valproate (including semi-sodium valproate/valproic acid) – plasma concentration significantly reduced (up to 100%). Referrer to discuss alternative antimicrobial options with microbiology.
Usual dose range	1g once daily
Renal and hepatic impairment	<u>Renal Impairment:</u> - eGFR <30ml/min/1.73m^2: 500mg once daily. Risk of seizures. <u>Hepatic Impairment:</u> No dosage adjustments required.
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Common side effects include diarrhoea, headache, injection-site reactions (extravasation, pruritus/burning/erythema at site, generalised fever), pruritus, rash (also reported with eosinophilia and systemic symptoms), nausea, raised platelet count, vomiting. Uncommon side effects include abdominal pain, anorexia, antibiotic-associated colitis, asthenia, bradycardia, chest pain, confusion, constipation, dizziness, dry mouth, dyspepsia, dyspnoea, hypotension, melaena, oedema, petechiae, pharyngeal discomfort, raised glucose, seizures, sleep disturbances, taste disturbances. Additional side effects that are rare/unknown frequency include agitation, anxiety, arrhythmia, blood disorders, cholecystitis, cough, depression, dysphagia, electrolyte disturbances, haemorrhage, hypoglycaemia, increase in blood pressure, jaundice, liver disorder, muscle cramp, nasal congestion, neutropenia, pelvic peritonitis, renal impairment, scleral disorder, syncope, thrombocytopenia, tremor, wheezing, dyskinesia, hallucinations.
Administration	Reconstitute 1g vial with 10ml WFI or sodium chloride 0.9%. Shake well to dissolve. Dilute further with sodium chloride 0.9% to a final concentration of 20mg/ml or less (e.g. 1g in 100ml sodium chloride 0.9%). Administer as an IV infusion over 30 minutes using either gravity infusion or an infusion pump suitable for community use.
Monitoring requirements	- Inflammatory markers and U&E's as indicated by clinical presentation. - For UTIs –ensure MSU taken prior to starting treatment to confirm MC+S.
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.	

Appendix 7 – Furosemide	
Indications	Oedema (peripheral or pulmonary) not responding to oral diuretics
Contra-indications	Previous allergy to furosemide or any other ingredients in furosemide injection. Anuria, comatose and pre-comatose states associated with liver cirrhosis, renal failure due to nephrotoxic or hepatotoxic drugs, severe hypokalaemia or hyponatraemia (referrer to check U+E's and renal function before initiating therapy).
Cautions	Renal impairment (monitor closely during treatment, see below). Diabetes (can cause hyperglycaemia), gout, hypotension (if prescribed other anti-hypertensives discuss with referrer need to withhold these), hypovolaemia (correct before starting treatment), prostatic hyperplasia (can cause urinary retention), hepatorenal syndrome, hypoproteinaemia (may reduce diuretic effect and increase risk of side-effects).
Significant Interactions	- Aminoglycosides, polymyxins and vancomycin - increased risk of otoxicity (reduce administration rate, referrer to consider alternative antimicrobials or delay IV diuretic therapy). - Amisulpride, arsenic trioxide, atomoxetine, cardiac glycosides, disopyramide, flecainide, lidocaine, pimozide and sotalol – hypokalaemia caused by IV furosemide increases the risk of cardiac toxicity (usually arrhythmias) when taken with these medicines (monitor potassium levels, referrer to consider alternative therapies or delay IV diuretic therapy until potassium corrected). - Lithium – reduced excretion of lithium (increased risk of toxicity) (avoid use or consider closely monitoring renal function, U+Es and lithium levels). - ACE inhibitors, alpha-blockers, angiotensin-II receptor antagonists and other medicines which lower blood pressure – enhanced hypotensive effect (discuss withholding anti-hypertensives during treatment with referrer). - NSAIDs – increased risk of nephrotoxicity and antagonism of diuretic effect (consider alternative analgesia during diuretic therapy). - Additional diuretics – Additive diuretic effect (discuss with referrer withholding/reducing whilst receiving IV treatment). - Antidiabetics – Hypoglycaemia effect reduced (monitor blood glucose levels, referrer to adjust doses of antidiabetics if necessary).
Usual dose range	Initially 20-50mg, doses increased at intervals of 20mg. Doses of 80mg once or twice a day under specialist advice (e.g. heart failure team). Doses above this not suitable for community administration. Doses should be timed to avoid nocturnal enuresis.
Renal and hepatic impairment	<u>Renal Impairment:</u> - GFR < 20ml/min: Higher doses may be required In severe renal impairment a lower rate of infusion may be necessary (discuss with heart failure team and monitor renal function closely). <u>Hepatic Impairment:</u> Monitor for hypokalaemia (may precipitate hepatic encephalopathy) and hypomagnesaemia (may cause arrhythmias).
Side effects	Very rare side effects include hyperuricaemia

	Side effects that have an unknown frequency include acute urinary retention, blood disorders, bone-marrow depression, deafness (usually with high doses and rapid intravenous administration, and in renal impairment), electrolyte disturbances, hepatic encephalopathy, hyperglycaemia, hypersensitivity reactions, hypocalcaemia, hypochloraemia, hypokalaemia, hypomagnesaemia, hyponatraemia, leucopenia, metabolic alkalosis, mild gastro-intestinal disturbances, pancreatitis, photosensitivity, postural hypotension, pruritus, rash, temporary increase in serum-cholesterol and triglyceride concentration, thrombocytopenia, tinnitus (usually with high doses and rapid intravenous administration, and in renal impairment), visual disturbances, gout, intrahepatic cholestasis.
Administration	Dilute with sodium chloride 0.9% (a common dilution is 1mg/ml) or give undiluted. Administer as an IV infusion using gravity or an infusion pump suitable for community use. The rate should not usually exceed 4mg/minute. Single doses of up to 80mg may be given more quickly including as a bolus (N.B. rapid administration may damage hearing and worsen renal function – monitor renal function closely and if deteriorating consider administering as an infusion).
Monitoring requirements	- U+E's and renal function regularly (if electrolyte disturbance or reducing renal function consider monitoring daily). - Blood pressure (prior to each dose, withold and/or request review of any other anti-hypertensives if BP low). - Blood glucose (if diabetic).
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.	

Appendix 8 – Gentamicin	
Indications	Gram-positive bacterial endocarditis or HACEK endocarditis (in combination with other antibacterials), septicaemia, meningitis and other CNS infections, biliary-tract infection, acute pyelonephritis, hospital acquired pneumonia, prostatitis. Long term treatment (beyond 72 hours) following discussion with consultant microbiologist/relevant specialist only.
Contra-indications	Previous allergy to gentamicin or any other ingredients in gentamicin injection. Allergy to other aminoglycosides (e.g. tobramycin) as cross-reactivity has been reported (discuss with microbiology). Myasthenia gravis. Patients requiring close therapeutic drug monitoring (including those with known poor renal function) – may be unable to hold doses while awaiting pre-dose levels (referrer would make adjustments/omissions at next dose). Must discuss and agree monitoring and dose adjustment process at the point of referral.
Cautions	Conditions characterised by muscular weakness, dehydration (correct before starting therapy), existing cochlear damage, renal impairment, elderly patients (monitor renal function). Where possible limit duration of treatment to 7 days.
Significant Interactions	- Ciclosporin, tacrolimus and other nephrotoxic drugs - increased risk of nephrotoxicity (monitor renal function closely, referrer to consider alternative antimicrobials). - Non-depolarising muscle relaxants - enhanced effects when given with aminoglycosides. - Neostigmine – effects antagonised by aminoglycosides. - Pyridostigmine - effects antagonised by aminoglycosides. - Suxamethonium - enhanced effects when given with aminoglycosides. - Vancomycin, IV furosemide, platinum compounds - increased risk of nephrotoxicity and ototoxicity (avoid concomitant use, monitor renal and auditory function). - Tazocin, teicoplanin (plus others not administered by AC@H) – Incompatible with gentamicin. Cannot be mixed or administered simultaneously. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.
Usual dose range	<u>Once daily dose regimens</u> Initially 5mg/kg daily (if weigh over 100kg seek advice on dose adjustments). Pre-dose levels should be taken prior to second dose to guide further dose adjustments however may be unable to hold doses whilst awaiting results (referrer to make adjustments/omissions at next dose) – this must be discussed and agreed as acceptable at the point of referral. Need for long-term treatment beyond 72 hours should be discussed with consultant microbiologist or relevant specialist. <u>Twice daily gentamicin dosing in endocarditis</u> 1-1.5mg/kg (up to a maximum of 120mg) twice a day Further dosing should be guided by pre and post dose levels.

<table>
<tr><td>Renal and hepatic impairment</td><td colspan="2"><u>Renal Impairment:</u>
Increased risk of ototoxicity and nephrotoxicity – monitor closely for all patients.
May require dose reduction/increased monitoring/alternative treatment.
Discuss with microbiology if renal function impaired prior to treatment or if reductions in renal function occur during treatment (if initial GFR<20ml/min alternative treatment should be considered).

<u>Hepatic Impairment:</u>
Nil monitoring or dosage adjustment required.</td></tr>
<tr><td>Side effects</td><td colspan="2">Uncommon side effects include rash.

Rare side effects include antibiotic-associated colitis, electrolyte disturbances, hypocalcaemia, hypokalaemia, hypomagnesaemia (on prolonged therapy), nausea, peripheral neuropathy, stomatitis, vomiting.

Very rare side effects include blood disorders, CNS effects, convulsions, encephalopathy, headache.

Additional side effects with an unknown frequency include auditory damage, impaired neuromuscular transmission, irreversible ototoxicity, nephrotoxicity (more common in elderly, monitor closely and consider dose reductions), vestibular damage.</td></tr>
<tr><td rowspan="3">Administration</td><td>Once daily doses of 200mg or more</td><td>Dilute with 50ml - 100ml sodium chloride 0.9% or glucose 5%.

Administer as an IV infusion over 30minutes using an infusion pump suitable for community use.
(N.B. use of an infusion follows PHNT policy, this is outside of manufacturer’s guidance).</td></tr>
<tr><td>Once daily doses less than 200mg
OR
Twice daily doses</td><td>Administer as an IV bolus over 3-5minutes.

Can be administered undiluted or diluted with sodium chloride 0.9% or glucose 5% (usually 10-20ml).</td></tr>
<tr><td colspan="2">N.B. Multiple incompatibilities including Tazocin and teicoplanin. Do not mix with or give through the same line at the same time. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.</td></tr>
<tr><td>Monitoring requirements</td><td colspan="2">- Gentamicin levels:
General advice:
o Must state on blood form the dose frequency (once/twice daily) and whether levels are ‘pre’ or ‘post’ dose as this will affect result interpretation.
o Sample must not be taken from the same line that gentamicin was administered through even if well flushed.

<u>Once daily regimen</u>
Only pre-dose (trough) levels required – take 22-24 hours after previous dose.
Levels should be checked following administration of the 2nd dose and then if within range repeated every 3 doses.</td></tr>
</table>

	Action to be taken: < 1mg/l – Continue with current dose. If renal function normal and stable repeat before every 3rd dose. If renal function reduced/unstable discuss with microbiology and repeat levels prior to each dose. >1mg/l – Discuss with referring clinican/consultant microbiologist, dosing period requires extension. Repeat levels required daily until <1mg/l (discuss with referring clinican/microbiology). <u>Twice daily regimen (endocarditis)</u> Take levels immediately before (trough) and one hour after the dose. Send both samples to the laboratory together. o Pre dose levels: <1mg/l o Post dose levels: 3-5mg/l - Renal function (in line with gentamicin levels or as advised by microbiology). - Inflammatory markers and U&E's as indicated by clinical presentation.
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.	

Appendix 9 – Heparin flush	
Indications	To maintain patency of catheters, cannulas and other indwelling intravenous infusion devices.
Contra-indications	Previous allergy to heparin or any other ingredients in heparin injection. Current or risk of heparin-induced thrombocytopenia.
Cautions	Known hypersensitivity to low molecular weight heparins. Platelet counts should be measured in patients receiving heparin flushes for longer than five days. In those who develop thrombocytopenia or paradoxical thrombosis, heparin should immediately be eliminated from all flushes and ports. Repeated flushing of a catheter device with heparin may result in a systemic anticoagulant effect.
Significant Interactions	- Blood sampling – heparin can alter results of blood tests when samples are taken via the device. The in situ heparin flush solution should be cleared from the device by aspirating and discarding a volume of solution equivalent to that of the indwelling venepuncture device before the desired blood sample is taken.
Usual dose range	For maintenance of TIVADs: Monthly flushes – 600units in 6ml Weekly flushes – 50units in 5ml Following administration of medicines via TIVAD or blood sampling – 50units in 5ml.
Renal and hepatic impairment	<u>Renal Impairment:</u> Nil dose adjustments/cautions <u>Hepatic Impairment:</u> Nil dose adjustments/cautions
Side effects	Hypersensitivity reactions to heparin are rare. They include urticaria, conjunctivitis, rhinitis, asthma, cyanosis, tachypnoea, feeling of oppression, fever, chills, angioneurotic oedema and anaphylactic shock. It is extremely unlikely that the low levels of heparin reaching the blood will have any systemic effect. However, there have been rare reports of immune-mediated thrombocytopenia and thrombosis in patients receiving heparin flushes – should this occur heparin should immediately be eliminated from all flushes and ports.
Administration	Administered as a flush (dose/volume and method according to device type). Staff to be trained and competent in flushing the specific device type.
Monitoring requirements	- Consider monitoring platelet counts in patients receiving consecutive heparin flushes for longer than 5 days (discuss with referring team).
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.	

Appendix – Levofloxacin	
Indications	Respiratory tract infection in patients with penicillin allergy. Specialist infections as advised by consultant microbiologist. Only to be used in patients unable to take medication orally – oral preparation well absorbed. ******Due to administration time requires double patient slot on caseload.******
Contra-indications	Patient able to take medication orally – referring clinician should switch to oral formulation. History of tendon disorders related to quinolone use.
Cautions	Conditions that predispose to seizures, exposure to excessive sunlight, G6PD deficiency, history of epilepsy, myasthenia gravis (risk of exacerbation), history of psychiatric illness. Can prolong QT interval – use caution if any of: acute myocardial infarction, bradycardia, congenital long QT syndrome, electrolyte disturbances, heart failure with reduced left ventricular ejection fraction, history of symptomatic arrhythmias – all risk factors for QT interval prolongation.
Significant Interactions	- Amiodarone, arsenic trioxide - increased risk of ventricular arrhythmias — referring clinician to consider alternative antibiotics. - Coumarin anticoagulants - levofloxacin possibly enhances anticoagulant effect of coumarins – increase monitoring of INR. - Aminophylline, theophylline - possible increased risk of convulsions – referring clinician to consider alternative antibiotics. - Artemether with Lumefantrine - avoidance of quinolones advised by manufacturer of artemether with lumefantrine - referring clinician to consider alternative antibiotics. - Ciclosporin - increased risk of nephrotoxicity when quinolones given with ciclosporin - referring clinician to consider alternative antibiotics. - NSAIDs - possible increased risk of convulsions when quinolones given with NSAIDs - referring clinician to consider alternative antibiotics or analgesia. - Other medicines known to prolong the QT interval.
Usual dose range	500mg 1-2 times a day
Renal and hepatic impairment	Renal Impairment: - eGFR 20-50ml/min/1.73m^2 - Usual initial dose, then use half normal dose. - eGFR < 20ml/min/1.73m^2 – Consult product literature.
Side effects	Rarely, profound hypotension may occur during infusion - if this happens halt the infusion immediately. The drug should be discontinued if psychiatric, neurological, or hypersensitivity reactions (including severe rash) occur. Common side effects include diarrhoea, dizziness, headache, nausea, vomiting. Uncommon side effects include abdominal pain, anorexia, anxiety, arthralgia, asthenia, blood disorders, confusion, depression, disturbances in taste, disturbances in vision, dyspepsia, eosinophilia, hallucinations, leucopenia, myalgia, rash, sleep disturbances, thrombocytopenia, tremor.

	Rare side effects include antibiotic-associated colitis, convulsions, disturbances in hearing, disturbances in smell, dyspnoea, hepatic dysfunction, hepatitis, hypotension, interstitial nephritis, jaundice, photosensitivity, psychoses, renal failure, symptoms of peripheral neuropathy (sometimes irreversible), tendon damage, tendon inflammation, vasculitis. Very rare side effects include Stevens-Johnson syndrome, toxic epidermal necrolysis.	
Administration	250mg dose	Provided ready diluted. Administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.
	500mg dose	Provided ready diluted. Administer as an IV infusion over 60 minutes. Due to infusion time ALL administrations must be given using an infusion pump suitable for community use.
	As above - Rarely, profound hypotension may occur during infusion. If this happens halt the infusion immediately.	
Monitoring requirements	- For those taking coumarin anticoagulants increase the frequency of INR monitoring. - Consider monitoring LFTs and renal function in long term treatment. - Inflammatory markers and U&E's as indicated by clinical presentation.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 10 – Meropenem	
Indications	Aerobic and anaerobic Gram-positive and Gram-negative infections. Exacerbations of chronic lower respiratory-tract infection in cystic fibrosis. Only to be used on recommendation of consultant microbiologist (or in RTIs following recommendation from relevant respiratory consultant).
Contra-indications	Previous allergy to meropenem, any other carbapenems or any other ingredients in meropenem injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam).
Cautions	Seizures have infrequently been reported during treatment, use caution in patients with uncontrolled epilepsy. Liver disease (see below).
Significant Interactions	- Valproate (including semi-sodium valproate/valproic acid)– plasma concentration significantly reduced (up to 100%). Discuss alternative antimicrobial options with microbiology.
Usual dose range	0.5-1g three times a day. Doses of 2g can be used in severe infections on the advice of microbiology only. Regimes of 3g once daily can be used for complex respiratory infections following recommendation from microbiology/respiratory consultant only – this is an unlicensed dose and where possible usual dose regimes should be used. Administration advice for this dose regime must be provided by referring clinician.
Renal and hepatic impairment	<u>Renal Impairment:</u> - eGFR 26–50ml/min/1.73m^2: Give 500 mg – 2 g (normal dose) twice daily - eGFR 10–25ml/min/1.73m^2: Give 500 mg – 1 g (half normal dose) twice daily - eGFR <10ml/min/1.73m^2: Give 500 mg – 1 g (half normal dose) daily <u>Hepatic Impairment:</u> Liver function should be regularly monitored. No adjustments are necessary.
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Common side effects include abdominal pain, diarrhoea, disturbances in liver function tests, headache, nausea, pruritus, rash, thrombocythaemia, vomiting. Uncommon side effects include eosinophilia, leucopenia, paraesthesia, thrombocytopenia. Additional side effects that are rare/unknown frequency include convulsions, antibiotic-associated colitis, haemolytic anaemia, Stevens-Johnson syndrome, toxic epidermal necrolysis.

Administration	500mg dose	Reconstitute 500mg vial with 10ml WFI Administer as an IV bolus over 5 minutes
	1 dose	Reconstitute 1g vial with 20ml WFI Administer as an IV bolus over 5 minutes
	2g dose	Reconstitute each 1g vial with 20ml WFI Dilute to 50-200ml using sodium chloride 0.9% or glucose 5%. Administer as an IV infusion over 15-30 minutes via either gravity infusion or using an infusion pump suitable for community use.
Monitoring requirements	- Regular LFTs in all patients. - Inflammatory markers and U&E's as indicated by clinical presentation. - INR may be affected (reports are rare), consider increasing monitoring frequency in patients taking coumarin anticoagulants.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 11 – Metoclopramide	
Indications	Prevention of postoperative nausea and vomiting, radiotherapy-induced nausea and vomiting, delayed (but not acute) chemotherapy-induced nausea and vomiting, symptomatic treatment of nausea and vomiting (including that associated with acute migraine where it may also be used to improve absorption of oral analgesics). Maximum duration 5 days due to risk of neurological adverse effects.
Contra-indications	Previous allergy to metoclopramide or any other ingredients in metoclopramide injection. 3–4 days after gastrointestinal surgery, known/suspected gastro-intestinal haemorrhage, obstruction or perforation. Epilepsy, Parkinson's disease, phaeochromocytoma.
Cautions	Asthma, atopic allergy, bradycardia, cardiac conduction disturbances, elderly, uncorrected electrolyte imbalance, young adults (15–19 years old). May mask underlying disorders such as cerebral irritation.
Significant Interactions	- Ciclosporin - metoclopramide increases plasma concentration of ciclosporin. - Levodopa or dopaminergic agonists – mutual antagonism (referrer to consider alternative anti-emetic). - Antipsychotics (or other drugs with risk of extrapyramidal effects) – increased risk of extrapyramidal effects (referrer to consider alternative anti-emetic).
Usual dose range	Body weight 60kg and above: 10mg up to 3 times a day. Body weight under 60kg: Up to 500 micrograms/kg daily in 3 divided doses. For short term use only (up to 5 days).
Renal and hepatic impairment	<u>Renal Impairment:</u> Increased risk of extrapyramidal effects in severe renal impairment – consider reducing dose or switching to alternative anti-emetic <u>Hepatic Impairment:</u> Reduce dose
Side effects	Metoclopramide can induce acute dystonic reactions involving facial and skeletal muscle spasms and oculogyric crises. These dystonic effects are more common in the young (especially girls and young women) and the very old; they usually occur shortly after starting treatment with metoclopramide and subside within 24 hours of stopping it. Injection of an antiparkinsonian drug such as procyclidine will abort dystonic attacks. Common side effects include extrapyramidal effects (especially in children and young adults aged 15–19 years), galactorrhoea, gynaecomastia, hyperprolactinaemia, menstrual changes.

	Additional side effects that are very rare/unknown frequency include cardiac conduction abnormalities (with IV administration), depression, methaemoglobinaemia (more severe in G6PD deficiency), neuroleptic malignant syndrome, anxiety, confusion, diarrhoea, dizziness, drowsiness, dyspnoea, hypotension, oedema, pruritus, rash, restlessness, tardive dyskinesia on prolonged administration, tremor, urticaria, visual disturbances.	
Administration	All doses	Give undiluted Administer as a slow IV bolus over at least 3 minutes
Monitoring requirements	- If significant vomiting consider need to monitor U+E's and renal function in case of dehydration.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix – Paracetamol		
Indications	Pain or pyrexia in patients unable to take medication orally. N.B. maximum frequency the team can administer is TDS – usually QDS dosing – responsible clinician should be notified at the point of referral.	
Contra-indications	Patient able to take medication orally (use oral paracetamol). Previous allergy to paracetamol or any other ingredients in paracetamol injection.	
Cautions	Co-administration with oral products containing paracetamol (minimum 4 hours between doses and 4g daily total). Alcohol dependence, chronic alcoholism, chronic dehydration, chronic malnutrition, hepatocellular insufficiency before administering.	
Significant Interactions	Nil significant interactions in BNF As above ensure minimum 4 hours between doses if used with other paracetamol containing products.	
Usual dose range	Body weight 50kg and above: 1g at least every 4 hours up to maximum of 4g daily. Body weight under 50kg: 15 mg/kg at least every 4–6 hours up to maximum of 60 mg/kg daily.	
Renal and hepatic impairment	<u>Renal impairment:</u> - eGFR<30ml/min/1.73m^2 - Increase dose interval to every 6 hours. <u>Hepatic impairment:</u> Dose-related toxicity—avoid large doses.	
Side effects	Rare side effects include flushing, tachycardia, acute generalised exanthematous pustulosis, malaise, skin reactions, Stevens-Johnson syndrome, toxic epidermal necrolysis. Side effects with an unknown frequency include hypotension, blood disorders, leucopenia, neutropenia, thrombocytopenia. Liver damage and less frequently renal damage can occur following overdose. Nausea and vomiting, the only early features of poisoning, usually settle within 24 hours. Persistence beyond this time, often associated with the onset of right subcostal pain and tenderness, usually indicates development of hepatic necrosis.	
Administration	All doses	Provided ready-diluted Administer as an IV infusion over 15 minutes via either gravity infusion or using an infusion pump suitable for community use.
Monitoring requirements	For short term use only – nil monitoring unless indicated by clinical presentation (e.g. if vomiting consider U+Es, renal function).	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 12 – Sodium Chloride 0.9% Infusion	
Indications	(Isotonic extracellular) dehydration which cannot be corrected with oral fluids.
Contra-indications	Previous hypersensitivity-type reaction (see details below) to sodium chloride infusion. Any of: Severe dehydration, significant hyponatraemia or hypernatraemia, severe renal impairment, metabolic acidosis → Not suitable for community management – consider Robin CAH or acute inpatient admission instead.
Cautions	Dilutional hyponatraemia, cardiac failure, peripheral oedema, pulmonary oedema, renal impairment (restrict intake), hypertension, primary hyperaldosteronism, liver disease (including cirrhosis), renal disease (including renal artery stenosis, nephrosclerosis), pre-eclampsia.
Significant Interactions	- Medications which can contribute to or worsen dehydration (e.g. diuretics) – referrer to consider withdrawing until rehydrated. - Medications which can cause electrolyte disturbances, particularly hyponatreaemia/hypokalaemia (e.g. diuretics) – referrer to consider withdrawing until rehydrated. - Medications that may increase the risk of sodium and fluid retention e.g. corticosteroids (monitor).
Usual dose range	Dosage, rate and duration of administration should be individualised according to several factors including age, weight, clinical condition, concomitant treatment and in particular the patient's hydration state, clinical and laboratory response to treatment. Suitable dosing regimens for community administration however are: - 500ml administered once or twice a day If larger volumes or a greater frequency are required the patient is not suitable for community management. Consider referral to Robin CAH for management or an acute inpatient admission.
Renal and hepatic impairment	<u>Renal Impairment:</u> Severe renal impairment – not suitable for community administration as requires closer monitoring <u>Hepatic Impairment:</u> Increased risk of sodium retention, fluid overload and oedema
Side effects	Symptoms of unknown aetiology which can appear to be hypersensitivity reactions have been reported very rarely in association with infusion of Sodium Chloride 0.9 %. These have been characterized as hypotension, pyrexia, tremor, chills, urticaria, rash and pruritus. Stop the infusion immediately if signs or symptoms of these reactions develop. Appropriate therapeutic countermeasures should be instituted as clinically indicated. Administration of large doses may give rise to sodium accumulation, hyperchloraemic acidosis, oedema or hyponatraemia.

Administration	500ml	Administer as an IV infusion over at least 30 minutes via either gravity infusion or using an infusion pump suitable for community use.
Monitoring requirements	- Regular monitoring of U+E's and renal function (at least alternate days, ideally daily). If nil recent bloods taken by referrer these should be taken at the point of cannulation. - If in care facility encourage use of fluid balance chart – monitor at each visit. - Clinical assessment of current hydration at each visit.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 13 – Tazocin (Piperacillin and tazobactam)	
Indications	Hospital-acquired pneumonia, septicaemia, complicated infections involving the urinary-tract or skin and soft tissues. Community initiation only after recommendation from consultant microbiologist or appropriate specialist.
Contra-indications	Previous allergy to Tazocin, any other penicillins or any other ingredients in Tazocin injection. A hypersensitive reaction to any other beta-lactam antibiotics (penicillins, cephalosporins, carbapenems e.g. meropenem/ertapenem or aztreonam).
Cautions	High doses may lead to hypernatraemia (owing to sodium content of preparations), hypokalaemia.
Significant Interactions	- Aminoglycosides – Incompatible with Tazocin. Cannot be mixed or administered simultaneously. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.
Usual dose range	4.5g three times a day
Renal and hepatic impairment	<u>Renal Impairment:</u> - eGFR 20–40ml/min/1.73m^2: Max 4.5g three times a day - eGFR <20ml/min/1.73m^2: Max 4.5g twice daily (N.B. dose reductions may differ in some literature including use of 2.25g doses) <u>Hepatic Impairment:</u> Jaundice and hepatitis can occur – monitor LFTs in long term treatment
Side effects	Hypersensitivity: Including: ANAPHYLAXIS - DISCONTINUE INTRAVENOUS ADMINISTRATION – COMMENCE MANAGEMENT OF SEVERE ANAPHYLAXIS Maculopapular rash or exanthema, pruritus, urticaria, oedema, shivering and anaphylactic or anaphylactoid reactions (e.g. bronchospasm) and allergic dermatitis have occurred. Common side effects include angioedema, diarrhoea, fever, joint pains, serum sickness-like reaction, nausea, vomiting. Uncommon side effects include constipation, dyspepsia, headache, hypotension, injection-site reactions, insomnia, jaundice, stomatitis Rare side effects include cerebral irritation, CNS toxicity (including convulsions), coagulation disorders, encephalopathy, haemolytic anaemia, interstitial nephritis, leucopenia, thrombocytopenia, abdominal pain, eosinophilia, hepatitis. Additional side effects that are very rare/unknown frequency include antibiotic-associated colitis, hypoglycaemia, hypokalaemia, pancytopenia, Steven-Johnson syndrome, toxic epidermal necrolysis.

Administration	2.25g dose	Reconstitute 2.25g vial with 10ml WFI or sodium chloride 0.9% Swirl until dissolved. When swirled constantly reconstitution should occur within 3 minutes. Dilute reconstituted solution further with sodium chloride 0.9% or glucose 5% to the desired volume (e.g. dilute to 50ml or add to a 100ml mini-bag). Administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.
	4.5g dose	Reconstitute 4.5g vial with 20ml of WFI or sodium chloride 0.9%. Swirl until dissolved. When swirled constantly reconstitution should occur within 3 minutes. Dilute reconstituted solution further with sodium chloride 0.9% or glucose 5% to the desired volume (e.g. dilute to 50ml or add to a 100ml mini-bag). Administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.
	Displacement values vary - consult individual product for details.	
	N.B. **Incompatible with all aminoglycosides.** Do not mix with or give through the same line at the same time as gentamicin, tobramycin etc. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.	
Monitoring requirements	- Inflammatory markers and U&E's as indicated by clinical presentation. - Consider monitoring LFTs, U&E's and FBCs in long term treatment.	
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.		

Appendix 14 – Teicoplanin	
Indications	Serious infections caused by Gram-positive bacteria (e.g. complicated skin and soft tissue infections, pneumonia). Streptococcal or enterococcal endocarditis (in combination with another antibacterial). Bone and joint infections. Not suitable for use as a single agent unless the pathogen is already documented and known to be susceptible or there is a high suspicion that the most likely pathogen(s) would be suitable for treatment with teicoplanin.
Contra-indications	Previous allergy to teicoplanin or any other ingredients in teicoplanin injection.
Cautions	Caution in patients with known hypersensitivity to vancomycin, as cross hypersensitivity reactions, including fatal anaphylactic shock, may occur (history of "red man syndrome" with vancomycin is not a contraindication to the use of teicoplanin). Renal impairment. Previous thrombocytopenia.
Significant Interactions	- Nephrotoxic drugs (e.g. aminoglycosides, NSAIDs) – closely monitor renal function during prolonged courses. - Ototoxic drugs (e.g. furosemide IV, aminoglycosides) – monitor auditory function. - Aminoglycosides – Incompatible with teicoplanin. Cannot be mixed or administered simultaneously. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.
Usual dose range	Teicoplanin comes in 400mg and 200mg vials, when calculating doses round up to the nearest 200mg. <u>Standard regimen- for all indications excepting endocarditis/bone and joint infections:</u> Load with three 12 hourly doses then convert to once daily maintenance teicoplanin starting on day 3 Loading dose: 6mg/kg for three 12 hourly doses Maintenance dose: - GFR >80 ml/min: 6mg/kg - GFR 30-80 ml/min: 6mg/kg on day 3 and then 3mg/kg from day 4 - GFR <30ml/hr: 6mg/kg on day 3 and then 2mg/kg from day 4 Rule of thumb dosing for patients weighing 50-100kg: For loading and maintenance doses if GFR >80ml/h those weighing 50-75Kg should receive 400mg, those weighing 75-100Kg should receive 600 mg Patients with GFR<80 or weigh <50Kg >100Kg must have their dose calculated according to weight as above. <u>High dose regimen - for endocarditis and bone and joint infections:</u> Dosing as advised by Microbiology

<table>
<tr><td>Renal and hepatic impairment</td><td colspan="2"><u>Renal Impairment:</u>
Dose reductions as above. In renal impairment consider monitoring renal function when also taking teicoplanin levels.

<u>Hepatic Impairment:</u>
Monitor LFTs in longer courses.</td></tr>
<tr><td>Side effects</td><td colspan="2">Common side effects include pruritus, rash.

Uncommon side effects include bronchospasm, diarrhoea, dizziness, eosinophilia, fever, headache, leucopenia, mild hearing loss, nausea, thrombocytopenia, thrombophlebitis, tinnitus, vestibular disorders, vomiting.

Side effects with an unknown frequency include exfoliative dermatitis, nephrotoxicity, renal failure, Stevens-Johnson syndrome, toxic epidermal necrolysis.

In rare cases (even at the first dose), red man syndrome (a complex of symptoms including pruritus, urticaria, erythema, angioneurotic oedema, tachycardia, hypotension, dyspnoea) has been observed. Stopping or slowing the infusion may result in cessation of these reactions. Infusion related reactions can be limited if the daily dose is not given via bolus injection but infused over a 30-minute period.</td></tr>
<tr><td rowspan="3">Administration</td><td>200-600mg dose</td><td>Slowly reconstitute each 200mg or 400mg vial with the 3.2ml of WFI provided.
Roll the vial gently until the powder has completely dissolved. Take care to avoid formation of foam. If it does foam, leave the vial to settle for 15 minutes until the foam subsides.

Reconstituted in this manner you will be able to extract 200mg in 3ml from the 200mg vial and 400mg in 3ml from the 400mg vial.

Administer all doses as an IV bolus over 3-5 minutes</td></tr>
<tr><td>Doses over 600mg</td><td>Reconstitute as above then dilute the required dose further with sodium chloride 0.9% or glucose 5% (e.g. 50ml or 100ml).

Administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.</td></tr>
<tr><td colspan="2">N.B. Incompatible with aminoglycosides. Do not mix with or give through the same line at the same time as gentamicin, tobramycin etc. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.</td></tr>
<tr><td>Monitoring requirements</td><td colspan="2">- Teicoplanin levels required if used for longer than 7 days. Take clotted blood immediately pre-dose, no requirement to wait for result before administering the dose.
Target level >20mg/l unless for endocarditis when target is >30mg/l.

- FBCs, LFTs and renal function (can monitor in line with teicoplanin levels).</td></tr>
<tr><td colspan="3">Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.</td></tr>
</table>

Appendix 15 – Tobramycin	
Indications	Complex respiratory tract infections where Pseudomonas Aeruginosa (or other susceptible organism) is confirmed/suspected. Usually prescribed in combination with a second antimicrobial. Other specialist indications following advice from consultant microbiologist or relevant specialist.
Contra-indications	Previous allergy to tobramycin or any other ingredients in tobramycin injection (including sodium metabisulphite). Allergy to other aminoglycosides (e.g. gentamicin) as cross-reactivity has been reported (discuss with microbiology). Myasthenia gravis. Patients requiring close therapeutic drug monitoring – unable to hold doses while awaiting pre-dose levels (can only make adjustments/omissions at next dose) – must be discussed and agreed as acceptable at the point of referral.
Cautions	Conditions characterised by muscular weakness, dehydration (correct before starting therapy), existing cochlear damage, renal impairment, elderly patients (monitor renal function). Where possible limit duration of treatment to 7 days.
Significant Interactions	- Ciclosporin, tacrolimus and other nephrotoxic drugs - increased risk of nephrotoxicity (monitor renal function closely, referrer to consider alternative antimicrobials). - Non-depolarising muscle relaxants - enhanced effects when given with aminoglycosides. - Neostigmine – effects antagonised by aminoglycosides. - Pyridostigmine - effects antagonised by aminoglycosides. - Suxamethonium - enhanced effects when given with aminoglycosides. - Vancomycin, IV furosemide, platinum compounds - increased risk of nephrotoxicity and ototoxicity (avoid concomitant use, monitor renal and auditory function). - Tazocin, teicoplanin (plus others not administered by AC@H) – Incompatible with tobramycin. Cannot be mixed or administered simultaneously. If only one line available separate the doses and flush well with sodium chloride 0.9% before and after each dose.
Usual dose range	As per specialist advice – higher doses often used for cystic fibrosis patients or other specialist indications. Can be given once daily (unlicensed) or three times a day. Peninsula Cystic Fibrosis network advises dose range of: - 10mg/kg once daily (max 660mg) or 4mg/kg three times a day.
Renal and hepatic impairment	<u>Renal Impairment:</u> Dosage reductions required – discuss with consultant microbiologist or relevant specialist (particularly if higher dose regimens being used). Ongoing doses should be guided by therapeutic drug monitoring. Avoid once-daily high dose regimens if eGFR <20ml/min/1.73m^2. <u>Hepatic Impairment:</u> Nil adjustments/monitoring required.
Side effects	Uncommon side effects include rash. Rare side effects include antibiotic-associated colitis, electrolyte disturbances, hypocalcaemia, hypokalaemia, hypomagnesaemia (on prolonged therapy),

<table>
<tr><td></td><td colspan="2">nausea, peripheral neuropathy, stomatitis, vomiting.

Very rare side effects include blood disorders, CNS effects, convulsions, encephalopathy, headache

Side effects with an unknown frequency include auditory damage, impaired neuromuscular transmission, impaired neuromuscular transmission, irreversible ototoxicity, nephrotoxicity (more common in elderly, monitor closely and consider dose reductions), transient myasthenic syndrome in patients with normal neuromuscular function with large doses given during surgery; vestibular damage</td></tr>
<tr><td rowspan="2">Administration</td><td>Once daily doses</td><td>Low dose regimens:
Administer as an IV bolus over 3-5 minutes

High dose regimens (10mg/kg for cystic fibrosis):
Dilute in 50-100ml sodium chloride 0.9% or glucose 5% and administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.</td></tr>
<tr><td>TDS doses</td><td>Administer as an IV bolus over 3-5 minutes or dilute in 50-100ml sodium chloride 0.9% or glucose 5% and administer as an IV infusion over 30 minutes via either gravity infusion or using an infusion pump suitable for community use.</td></tr>
<tr><td>Monitoring requirements</td><td colspan="2">- Tobramycin levels – confirm specific requirements at point of referral as will vary depending on regime.

Unable to hold doses whilst awaiting pre-dose levels (can only make adjustments/omissions at next dose) – must be discussed and agreed as acceptable at the point of referral.

<u>Usual schedule for once daily regimens for Ps. Aeruginosa respiratory tract infections:</u>
Only pre-dose levels required (taken 20-24 hours post dose) taken prior to the 2nd and the 5-8th dose. Subsequent levels dependent on previous results.
Levels must be <1.0mg/l however reductions may be made if levels are 0.5mg/l-1.0mg/l (seek advice from referring clinician).

<u>General advice:</u>
o Must state on blood form dose frequency (once daily/tds) and whether levels are ‘pre’ or ‘post’ dose as will affect result interpretation.
o Sample must not be taken from same line that tobramycin is administered through even if well flushed.

- Sodium, Calcium and Magnesium (U&E’s) –check alongside tobramycin levels (magnesium deficiency increases risk of toxicity).
- Renal function (particularly if impaired) – check alongside tobramycin levels.
- Monitor hearing and balance.</td></tr>
<tr><td colspan="3">Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.</td></tr>
</table>

Appendix B – Additional Intervention to be administered by AC@H service					
Patient Name		NHS number		Date of Birth	
Planned intervention					
Side effects					
Administration					
Monitoring requirements					
Consult BNF or SPC for full lists of contra-indications, cautions and side effects or seek additional information from AC@H pharmacist/manager.					

Completed by…….. Date…….

Approved in discussion with……..Date……