MONOGRAPH	
Ceftriaxone Monograph - Paediatric	
Scope (Staff):	Clinical Staff- Medical, Nursing, Pharmacy
Scope (Area):	Perth Children's Hospital (PCH)

This document should be read in conjunction with this DISCLAIMER

DESCRIPTION	• Ceftriaxone is a bactericidal broad spectrum third generation cephalosporin antibiotic.(1-3) • It interferes with bacterial cell wall peptidoglycan synthesis by binding to penicillin-binding proteins resulting in cell lysis.(1-5)
INDICATIONS AND RESTRICTIONS	• Ceftriaxone is a broad spectrum cephalosporin and is active against the majority of community-associated enteric Gram-negative rods, beta-haemolytic Streptococci and *Streptococcus pneumoniae*.(5) Ceftriaxone also has dose dependent anti-staphylococcal activity and significant activity against gram negative organisms and penetrates the CSF.(5, 6) **IV: Monitored (orange) antibiotic** • If the use is consistent with a standard approved indication, this must be communicated to ChAMP by documenting that indication on all prescriptions (inpatient and outpatient). • The ChAMP team will review if ongoing therapy is required and/or if the order does not meet ChAMP Standard Indications. • If use is not for a standard approved indication, phone approval must be obtained from ChAMP before prescribing.
CONTRAINDICATIONS	• Ceftriaxone is generally contraindicated in patients with a history of high risk allergy to cephalosporins.
PRECAUTIONS	• Ceftriaxone may be prescribed in selected patients with high risk allergy to another Beta-lactam sub-class (e.g. some penicillins, carbapenems) in discussion with immunology.(2, 3, 7) • Patients with previous low risk reactions to a Beta-lactam (delayed rash (>1hr after initial exposure) without mucosal or systemic involvement) the risk of subsequent reaction to that agent is low. Re-challenge may be acceptable in discussion with immunology.(7) • IV aminoglycoside antibiotics are inactivated by IV penicillins

	and cephalosporins. Aminoglycoside antibiotics are rapidly bactericidal and should be administered first. The line should then be flushed well with a compatible fluid and the cephalosporin administered.[8] • Rapid IV infusion of high doses may result in seizures, especially in patients with renal impairment.[2, 7] **Neonates less than 28 days of age:** • Ceftriaxone has been associated with fatal systemic calcinosis in neonates. • It is highly protein bound and may displace bilirubin from albumin in neonates, increasing the risk of bilirubin encephalopathy.[1, 2] • Cefotaxime is therefore the preferred third-generation cephalosporin in this age group. • If ceftriaxone must be used, **do NOT** administer ceftriaxone and IV calcium containing products within 48 hours of each other (via the same **OR** separate infusion lines/sites).[1, 5, 7] **Patients older than 28 days**: • Ceftriaxone and calcium containing solutions may be administered sequentially (or concurrently if using completely separate lines) as long as the lines are flushed well with a compatible fluid between infusions. [1, 5, 7]
FORMULATIONS	**Available at PCH:** • Ceftriaxone (AFT) 1g Vial • Ceftriaxone (AFT) 2g Vial **Other formulations available:** • Ceftriaxone powder for injection 1g and 2g vial (multiple generic brands)
DOSAGE	• The doses listed below fall within the standard range. • Higher doses may be prescribed for certain situations in consultation with an infectious diseases or clinical microbiology consultant. **Neonates (less than 30 days of age):** • Ceftriaxone should be avoided in neonates (<1 month). If a third-generation cephalosporin is required, cefotaxime should be prescribed. Please refer to Neonatal Medication Protocols

	Children (1 month to 18 years): **IV or IM:** • **Usual dose:** 50mg/kg/dose (to a maximum of 2 grams) 24 hourly.[2, 3, 9] • **Meningitis or severe sepsis:** 100mg/kg/dose (to a maximum of 4grams) 24 hourly **OR** 50mg/kg/dose (to a maximum of 2grams) 12 hourly.[2, 3, 9] **IM – Post exposure prophylaxis:** **Meningococcal prophylaxis:** • Children ≥ 1 month and < 12 years of age: 125mg as a single dose[9] • Children ≥ 12 years of age: 250mg as a single dose[2] ***Haemophilus influenzae* type b (Hib) prophylaxis:** • Children ≥ 1 month: 50mg/kg/dose (to a maximum of 1gram) once daily for TWO days.[2] **Post exposure prophylaxis or treatment of confirmed Gonococcal disease:** • Children ≥ 1 month: 50mg/kg (to a maximum of 500mg) as a single dose.[10] • Dose should be given in conjunction with an oral dose of azithromycin due to the risk of resistance.[10] • Cefotaxime is preferred in neonates, refer to neonatal monograph for dosing. Refer to the Medical Prophylaxis ChAMP empiric guidelines for further information on the use of ceftriaxone for medical prophylaxis
DOSAGE ADJUSTMENT	**Dose reduction required in renal impairment**: • Dose reduction may be required in cases of significant renal impairment with a creatinine clearance of less than 10mL/minute. • Maximum recommended daily dose of 50mg/kg/DAY or 2 grams per day (whichever is less). Contact Pharmacy for advice.[3, 6, 11, 12] **Dosage reduction required in hepatic impairment:** • No dosage adjustment is required in hepatic impairment unless in conjunction with severe renal impairment. Contact Pharmacy for advice.[3, 6, 11, 12]

RECONSTITUTION

IV:

- The below reconstitution recommendations are brand specific. Please consult product information for alternative brands.

Vial size	Volume of water for injections	Concentration
1 gram (AFT brand)	9.4mL	100mg/mL
2 gram (AFT) brand	18.9mL	100mg/mL

- Further dilution with a compatible fluid to a final concentration of 40mg/mL or less is required prior to administration.[7, 11]

IM:

- Reconstitute each 1gram vial with 2.3mL of lidocaine (lignocaine) 1% (10mg/mL) or water for injection. This results in a final concentration of 350mg/mL.[7, 8]
- **Note: Preparations with lidocaine (lignocaine) 1% (10mg/mL) as diluent must NEVER be given intravenously**.[1, 7, 11]
- Intramuscular Injection Procedure

ADMINISTRATION

IV infusion (preferred):

- Dilute the required dose to a final concentration of 40mg/mL or weaker and infuse over 30 minutes.[3, 7, 11]
- In emergency situations or where there is a clinical need (e.g. HiTH) faster infusion times have been used.[3, 7, 11] It should be noted that the faster infusion times have been associated with increased risk of seizures.[2]

IV push:

- Dilute the required dose to a final concentration of 40mg/mL or weaker and administer as a push over 5 to 15 minutes.[2, 3, 11]

IM injection:

- Maximum recommended single IM dose is 2grams. For doses higher than 1gram, the dose **must** be split between 2 sites.[7, 11]
- Administer up to 1gram with a maximum concentration of 350mg/mL via deep injection into a large muscle mass e.g. thigh, buttocks.[7]

MONITORING

Renal, hepatic and haematological function should be monitored weekly with prolonged therapy (i.e. longer than 7 days) and/or with high dose treatment.[2-4]

ADVERSE EFFECTS	**Common:** diarrhoea, nausea, vomiting, pain and inflammation at injection site, rash, headache, dizziness, allergy, *Clostridium difficile*-associated disease, abdominal pain, vulvovaginal candidiasis.[2, 4] **Rare:** neurotoxicity (e.g. confusion, seizures, encephalopathy), blood dyscrasias (e.g. neutropenia), thrombocytopenia, bleeding, renal impairment, pancreatitis, cholecystitis, pseudolithiasis (reversible biliary sludge formation due to calcium-ceftriaxone complex), nephrolithiasis (formation of calcium-ceftriaxone renal stones), haemolytic anaemia, severe cutaneous adverse reactions (SCARs). Immunologic reactions including eosinophilia, drug fever, anaphylaxis, angioedema, urticaria, haemolytic anaemia, Stevens-Johnson syndrome, toxic epidermal necrolysis, interstitial nephritis, arthritis, serum sickness-like syndrome.[2, 7]
COMPATIBLE FLUIDS	• Sodium chloride 0.9%, • Glucose 5% and 10% • Glucose/sodium chloride solutions • Mannitol 10%[7] **Ceftriaxone is INCOMPATIBLE with calcium containing intravenous solutions including parenteral nutrition, Ringer's and Hartmann's solution because precipitation may occur.** [7, 11]
STORAGE	Store vials below 25˚C[1] Store syringes prepared by PCS between 2 and 8˚C.[7]
INTERACTIONS	**Ceftriaxone may interact with other medications; please consult PCH approved references (e.g. Clinical Pharmacology), your ward pharmacist or Pharmacy on extension 63546 for more information.** • Ceftriaxone is incompatible with calcium containing intravenous solutions because precipitation may occur. Refer to precautions section for further information.[1, 2, 5, 7, 11] • IV aminoglycoside antibiotics are inactivated by IV penicillins and cephalosporins. Aminoglycoside antibiotics are rapidly bactericidal and should be administered first. The line should then be flushed well with a compatible fluid and the cephalosporin administered.[3, 7] • The use of ceftriaxone in conjunction with warfarin may increase INR and increase the risk of bleeding.[2, 6] • Ciclosporin (cyclosporin) levels may increase if ceftriaxone is added. There is limited information on this interaction, close monitoring of ciclosporin (cyclosporin) levels is required.[6] • The addition of furosemide (frusemide) to ceftriaxone may

	increase the risk of nephrotoxicity, especially in patients with renal impairment (including minor or transient renal impairment)[6]
COMMENTS	Each 1 gram vial contains 83mg (3.6mmol) of sodium.[2]
MANUFACTURER SAFETY DATA SHEET (SDS)	To access to the Manufacturer SDS for this product, use the following link to ChemAlert.

Please note: The information contained in this guideline is to assist with the preparation and administration of **ceftriaxone**. Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related CAHS internal policies, procedures and guidelines
Antimicrobial Stewardship Policy
ChAMP Empiric Guidelines and Monographs
KEMH Neonatal Medication Protocols

References and related external legislation, policies, and guidelines *(if required)*

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