MONOGRAPH

Ceftriaxone Monograph - Paediatric

Scope (Staff):	Medical, Pharmacy, Nursing
Scope (Area):	All Clinical Areas (Perth Children's Hospital)

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this DISCLAIMER

QUICKLINKS

Dosage/Dosage Adjustments	Administration	Compatibility	Monitoring

DRUG CLASS

Broad spectrum third generation cephalosporin.[1-3]

INDICATIONS AND RESTRICTIONS

Ceftriaxone is a broad-spectrum cephalosporin with good CSF penetration. It is active against most community-associated enteric Gram-negative organisms, beta-haemolytic Streptococci and *Streptococcus pneumoniae*. It is not active against Enterococci.[1, 2, 4]

For patients admitted to Hospital in the Home (HiTH) from the PCH Emergency Department, ceftriaxone may be used for cellulitis or lymphadenitis. Refer to HiTH Common Conditions and Emergency Department Referral Pathways.

Oral: 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

- Hypersensitivity to ceftriaxone or any component of the formulation or patients with a history of high risk allergy to cephalosporins.[1-3]

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.[1-3]
- 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.[3, 5, 6]
- Rapid IV infusion of high doses may result in seizures, especially in patients with renal impairment.[1, 5]

Neonates less than 44 weeks corrected gestational age:

- Ceftriaxone should be used with extreme caution in neonates less than 41 weeks corrected gestational age.[2, 3] Cefotaxime is the preferred third-generation cephalosporin in this age group.[4]
- Ceftriaxone has been associated with fatal systemic calcinosis when used in neonates also prescribed intravenous calcium containing preparations.[3, 4]
- 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, 2, 4, 6-8]
- Ceftriaxone is highly protein bound and may displace bilirubin from albumin in neonates, increasing the risk of bilirubin encephalopathy.[2-4, 6]

Children and infants older than 44 weeks corrected gestational age:

- Ceftriaxone and calcium containing solutions may be administered sequentially (or concurrently if using separate lines) as long as the lines are flushed well with a compatible fluid between infusions. [2, 4, 8]

FORMULATIONS

Listed below are products available at PCH, other formulations may be available, check with pharmacy if required:

- Ceftriaxone 1 g and 2 g vials

Imprest location: Formulary One

DOSAGE & DOSAGE ADJUSTMENTS

Neonates: Refer to Neonatal Medication Protocols

- Ceftriaxone should be avoided in neonates (<44 weeks corrected gestational age). If a third-generation cephalosporin is required, cefotaxime should be prescribed.

Children (≥ 4 weeks to 18 years):

Treatment - IV or IM:

- **Usual dose:** 50 mg/kg/dose (to a maximum of 2 grams) given 24 hourly.[1, 4, 7]

- **Meningitis or severe sepsis:** 50 mg/kg/dose (to a maximum of 2 grams) given 12 hourly **OR** 100 mg/kg/dose (to a maximum of 4 grams) given 24 hourly.[1, 4, 7].

Post exposure prophylaxis – IV or IM:

- Refer to the Medical Prophylaxis ChAMP empiric guidelines for further information on the use of ceftriaxone for medical prophylaxis.

Meningococcal prophylaxis:

- Children ≥ 4 weeks and < 12 years of age: 125 mg as a single IM dose.[7]
- Children ≥ 12 years of age: 250 mg as a single IM dose.[7]

***Haemophilus influenzae* type b (Hib) prophylaxis:**

- Children ≥ 4 weeks: 50 mg/kg/dose (to a maximum of 1 gram) IM once daily for TWO days.[1, 7]

Post exposure prophylaxis or treatment of confirmed Gonococcal disease:

- Children ≥ 4 weeks: 50 mg/kg (to a maximum of 500 mg) as a single IM dose.[9, 10]
- Dose should be given in conjunction with an oral dose of azithromycin due to the risk of resistance.[9, 10]

Dosing in Overweight and Obese Children: Dose based on measured body weight.[11]

Renal impairment:

eGFR calculator

- Dose reduction may be required in cases of significant renal impairment with a creatinine clearance of less than 10mL/minute/1.73m^2.[2, 6]
- Maximum recommended daily dose of 50 mg/kg/DAY or 2 grams per day (whichever is less).[2, 3]

Hepatic impairment:

- No dosage adjustment is required in hepatic impairment unless in conjunction with severe renal impairment.[2, 3]

RECONSTITUTION & ADMINISTRATION

IV reconstitution:

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

Vial size	Volume of water for injections	Concentration	Powder volume[5]
1 gram (AFT brand)	9.4 mL	100 mg/mL	0.6 mL
2 gram (AFT) brand	18.9 mL	100 mg/mL	1.1 mL

- Further dilution with a compatible fluid to a final concentration of 40 mg/mL or less is required prior to administration.[5, 8]

IM reconstitution:

- Reconstitute each 1 gram (AFT brand) vial with 2.3 mL of lidocaine 1% (10 mg/mL) or water for injection. This results in a final concentration of 350 mg/mL.[5]
- Please consult product information for alternative brands.
- **Note: Preparations with lidocaine 1% (10 mg/mL) as diluent must NEVER be given intravenously**.[5, 8, 12]

  Intramuscular Injection Procedure

IV infusion (preferred):

- Dilute the required dose to a final concentration of 40 mg/mL or weaker and infuse over 30 minutes.[5, 8]
- In emergency situations or where there is a clinical need (e.g. HiTH) faster infusion times have been used.[5, 8]

IV push:

- Dilute the required dose to a final concentration of 40 mg/mL or weaker and administer as a push over 5 to 15 minutes.[5, 8]

IM injection:

- Maximum recommended single IM dose is 2 grams. For doses higher than 1 gram, the dose **must** be split between 2 sites.[5, 8]
- Administer up to 1 gram with a maximum concentration of 350 mg/mL via deep injection into a large muscle mass (ventrogluteal site is preferred).[5]

COMPATIBILITY *(LIST IS NOT EXHAUSTIVE)*

Compatible fluids:

- Sodium chloride 0.9%,
- Glucose 5% and 10%
- Glucose/sodium chloride solutions
- Mannitol 10%[5]

Compatible at Y-site:

Compatibilities of IV drugs must be checked when two or more drugs are given concurrently.

INCOMPATIBLE drugs:

- Ceftriaxone is INCOMPATIBLE with calcium containing intravenous solutions including parenteral nutrition, Ringer's and Hartmann's solution because precipitation may occur. [1, 5, 6, 8]

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.[1, 3, 6]

ADVERSE EFFECTS

Common: diarrhoea, nausea, vomiting, pain and inflammation at injection site, rash, headache, dizziness, allergy, *Clostridioides difficile*-associated disease, abdominal pain, hepatitis, anaemia, vulvovaginal candidiasis.[1, 6]

Infrequent: anaphylaxis, angioedema.[1, 6]

Rare: neurotoxicity (e.g. confusion, seizures, encephalopathy), blood dyscrasias (e.g. neutropenia, agranulocytosis), thrombocytopenia, bleeding, renal impairment, pancreatitis, cholecystitis, pseudolithiasis (reversible biliary sludge formation due to calcium-ceftriaxone complex), nephrolithiasis (formation of calcium-ceftriaxone renal stones), severe cutaneous adverse reactions (SCARs), glucosuria, haematuria, oedema.

Immunologic reactions including eosinophilia, drug fever, urticaria, haemolytic anaemia, Stevens-Johnson syndrome, toxic epidermal necrolysis, interstitial nephritis, arthritis, serum sickness-like syndrome.[1, 6]

STORAGE

- Store vials below 25˚C and protect from light.[5, 8, 12]
- Store syringes prepared by Pharmacy Compounding Service (PCS) between 2 and 8˚C.[5]

INTERACTIONS

This medication may interact with other medications; consult PCH approved references (e.g. Clinical Pharmacology), a clinical pharmacist or PCH Medicines Information Service on extension 63546 for more information.

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
- Intramuscular (IM) Injections

References

1. Australian Medicines Handbook. Adelaide, S. Aust.: Australian Medicines Handbook; 2023 [cited 2023 2nd May]. Available from: https://amhonline-amh-net-au.pklibresources.health.wa.gov.au/.
2. Clinical Pharmacology powered by ClinicalKey [Internet]. Elsvier. 2023 [cited 2023 August 3rd]. Available from: https://www-clinicalkey-com.pklibresources.health.wa.gov.au/pharmacology/.
3. Up To Date - Paediatric Drug information [Internet]. Lexicomp. 2023 [cited 2023 July 31st]. Available from: https://www-uptodate-com.pklibresources.health.wa.gov.au/contents/table-of-contents/drug-information/pediatric-drug-information.

4. Antibiotic Writing Group. Therapeutic Guidelines - Antibiotic. West Melbourne: Therapeutic Guidelines Ltd; 2022. Available from: https://tgldcdp-tg-org-au.pklibresources.health.wa.gov.au/etgAccess.
5. Symons K. Ermer J. (editors). Australian injectable drugs handbook. Collingwood: The Society of Hospital Pharmacists of Australia; 2022.
6. Paediatric Formulary Committee. BNF for Children: 2023. London: BMJ Group Pharmaceutical Press; 2023.
7. Royal Australian College of General Practitioners, Pharmaceutical Society of Australia, Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists. AMH: Children's Dosing Companion. Adelaide: Australian Medicines Handbook Pty Ltd; 2022.
8. Pediatric Injectable Drugs. Maryland: American Society of Health -System Pharmacists; 2020.
9. Sexual Health and Blood-borne virus program. Silver book - A guide for managing sexually transmitted infections. Department of Health - Western Australia; 2020.
10. The Australasian Society for HIV Viral Heaptitis and Sexual Health Medicine. Australian STI Manegement Guidelines - Gonorrhoea: The Australasian Society for HIV, Viral Heaptitis and Sexual Health Medicine.; 2023 [Available from: https://sti.guidelines.org.au/sexually-transmissible-infections/gonorrhoea/.
11. Kendrick JG, Carr RR, Ensom MH. Pediatric Obesity: Pharmacokinetics and Implications for Drug Dosing. Clin Ther. 2015;37(9):1897-923.
12. MIMS Australia. MIMS online [full product information]. St Leonards, N.S.W: CMP Medica Australia.; 2022 [cited 2023 21st Mar].

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