MONOGRAPH

HEPARIN

Scope (Staff):	Medical, Pharmacy, Nursing, Anaesthetic Technicians
Scope (Area):	Perth Children's Hospital (PCH)

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

⚠ HIGH RISK MEDICINE ⚠

QUICKLINKS

DRUG CLASS

Heparin is an anticoagulant.[1]

Heparin is a High Risk Medicine.

INDICATIONS AND RESTRICTIONS

This guideline provides information on the use of heparin for maintenance of central venous access device (CVAD) or intra-arterial cannula patency **in Paediatric Critical Care Unit (PCC)** and treatment/prophylaxis of systemic thrombosis in all clinical areas.

For information on heparin lock for CVAD and Midline, refer to the Clinical Practice Manual.

Indications:

- Treatment and prophylaxis of venous or arterial thrombosis, pulmonary embolism [including post-interventional cardiac catheterisation procedures (e.g. stenting, atrial septal defect closure) and Blalock-Taussig shunt procedure].[2]
- Bridging therapy while stabilising target INR during initiation or recommencement of warfarin therapy.[3]
- Maintain patency of CVAD or intra-arterial cannula and prevention of cannula/catheter-associated embolism in PCC.[2]

CONTRAINDICATIONS

- Hypersensitivity to heparin, porcine protein or any component of the formulation.[4]
- Severe thrombocytopenia.[5]
- Uncontrollable active bleeding (except disseminated intravascular coagulation associated bleeding). [1, 5]
- History of heparin or low molecular weight heparin-induced thrombocytopenia.[1, 5]
- Severe hepatic impairment or disease (including oesophageal varices).[1]

PRECAUTIONS

- Hepatic impairment – increased risk of bleeding.[5]
- Avoid intramuscular administration of any medications in patients receiving heparin – risk of bleeding, bruising or haematoma.[5]
- Intrathecal or epidural analgesia/anaesthesia, lumbar puncture – risk of epidural haematoma which may cause paralysis.[1]
- Regional technique or lumbar puncture procedure:
  - Withhold IV/subcut heparin for 4 – 6 hours and check activated partial thromboplastin time (aPTT) has normalised prior to procedure.[6]
  - Heparin may be recommenced after at least 1-hour post-procedure provided coagulation haemostasis is appropriate.[7]
- Surgical patients:
  - Consider ceasing IV/subcut heparin 4 – 6 hours prior to surgery.[8] Check renal function pre-operatively to exclude possibility of delayed drug clearance.[9] Consider checking aPTT prior to surgery.
  - It is recommended that heparin (if still indicated) is recommenced at least 24 hours after the procedure and when post-operative haemostasis is deemed adequate (at least 48 hours for patients at high risk of post-operative bleeding).[8]
  - Recommence infusion without bolus dose and at the same rate that was used prior to procedure.[8]

FORMULATIONS

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

Ampoules: 50 units/5 mL, 1000 units/mL, 5000 units/5 mL, 5000 units/mL.

Syringes:

- Maintenance of line patency in PCC: 50 units/50 mL (in sodium chloride 0.9%) Baxter®
- CVAD line locking as per guideline: 500 units/5 mL (in sodium chloride 0.9%) Baxter®

Imprest location: Formulary One

PRESCRIBING

IV infusion:

- Prescribe on MR 828.04 Variable Rate IV Medication Infusion Chart (PCC only) or MR828 Fluid Therapy Order sheet (all wards other than PCC).
- On general ward areas where infusion rate is prescribed as a single rate, each infusion rate change must be prescribed.
- Intended continuous infusion rate must be prescribed in **BOTH units/kg/hour AND** the corresponding **mL/hr**.

Intermittent subcutaneous injection:

- Prescribe on WA Paediatric Hospital Medication Chart (PHMC).

DOSAGE & DOSAGE ADJUSTMENTS

Thromboprophylaxis ("low-dose"):

- Continuous IV infusion (all ages): 10 units/kg/hour (max 500 units/hour).[10]
- Intermittent subcut injection (≥ 1 month): 100 units/kg (max 5000 units), TWICE daily.[11]

Treatment of thrombosis or bridging therapy for warfarin ("high-dose"): continuous IV infusion[3, 10]

Patient's age	< 1 year old	≥ 1 year old
LOADING dose[12]	Not routinely recommended, discuss with haematology	
Initial **maintenance** dose	28 units/kg/hour	20 units/kg/hour

Maintenance rate is to be adjusted according to target aPTT level. Refer to **monitoring section**.

Maintenance of line patency in PCC (Intra-arterial, CVC, pulmonary artery, left atrium)[13, 14]

Heparin 50 units/50 mL in sodium chloride 0.9%

- Neonates: 1 mL/hr.
- All other patients: 2 mL/hr.

Renal impairment:

- No specific dosage adjustment recommended; titrate to target aPTT or antifactor-Xa.[2]

Hepatic impairment:

- No specific dosage adjustment recommended; titrate to target aPTT or antifactor-Xa.[2]

ADMINISTRATION

- Invert the syringe at least 6 times when preparing heparin infusion to prevent pooling of heparin.[15]
- Dilution for treatment or prophylaxis of thrombosis (IV infusion), including in continuous Veno-Venous Haemodiafiltration (CVVHDF) and Extra-Corporeal Membrane Oxygenation (ECMO):

Patient's Weight	Concentration (in sodium chloride 0.9% or glucose 5%)	Notes
10kg or less	3 000 units in **30mL** (100 units/mL)	In a 10 kg patient, 10 units/kg/hour = 1 mL/hour
Above 10kg	20 000 units in 50mL (400 units/mL)	In a 20 kg patient, 10 units/kg/hour = 0.5 mL/hour

- Bolus/loading doses should be administered over at least 10 minutes. *(Note there is a separate heparin bolus program on the BBraun infusion pump drug library)*
- Subcutaneous injection – administer undiluted. Rotate site of injection.[15]
- IM injection is not recommended.[15]

COMPATIBILITY *(LIST IS NOT EXHAUSTIVE)*

Compatible fluids:

Glucose 5%, glucose 10%, sodium chloride 0.9%.[5]

Only commonly used drugs are listed below. This is not a complete list of incompatible drugs. Compatibilities of IV drugs must be checked when two or more drugs are given concurrently.

INCOMPATIBLE drugs:

Alteplase, amiodarone, benzylpenicillin, caspofungin ciprofloxacin, diazepam, dobutamine, droperidol, gentamicin, ketamine, labetalol, phenytoin sodium, tobramycin, tramadol.[5, 15]

MONITORING

Monitoring parameters

- aPTT (as per nomogram then daily once aPTT within therapeutic range).[16]
- Antifactor-Xa levels should be used to monitor heparin therapeutic activity in patients <1 year as aPTT levels may be inaccurate in this patient group.[10]
- Daily full blood picture.[5]
- Potassium – especially for treatment longer than 7 days in patients at risk of hyperkalaemia.[11]
- Monitor for bruising, petechiae, signs of haemorrhage (nosebleeds, haematuria, tarry stools).[5]

Low dose heparin (thromboprophylaxis) – routine aPTT monitoring not recommended unless patient is at high risk of bleeding or develops clinical signs of bleeding.[10]

High dose heparin (treatment of thrombosis) – obtain blood sample 4 hours after loading dose, initiation of infusion or change in infusion rate.[10]

- Infants <1 year old – titrate dose to target **antifactor-Xa** level of **0.35-0.7 units/mL**.[10, 12] Consider consultation with a haematologist for advice on dose titration and patient specific target anti-factor-Xa level.
- Children ≥ 1 year old – adjust dose according to target activated partial thromboplastin time **(aPTT)** as outlined below:

Nomogram for heparin dose adjustment based on **aPTT**[10]

aPTT (seconds)	Bolus	Withhold (minutes)	Rate change (%)	Repeat aPTT
< 50	Not routinely recommended, discuss with haematology	0	+10%	4 hours
50-59	0	0	+10%	4 hours
60-85 **TARGET**	0	0	0	Next day
86-95	0	0	-10%	4 hours
96-120	0	30	-10%	4 hours
> 120	0	60	-15%	4 hours

Protamine may be used to reverse the effects of heparin. Calculate dose required based on the estimated amount of heparin remaining in plasma at the time that reversal is indicated. Refer to table below for dosing recommendation[10]:

Time since last heparin dose (minutes)	Protamine dose
< 30	1 mg/100 units heparin received
30 – 60	0.5-0.75 mg/100 units heparin received
60 – 120	0.375-0.5 mg/100 units heparin received
>120	0.25-0.375 mg/100 units heparin received

ADVERSE EFFECTS

Common: Bleeding, bruising and pain at injection site, mild reversible thrombocytopenia,hyperkalaemia.[1]

Infrequent: Transient liver aminotransferases elevation, heparin-induced thrombocytopenia.[1]

Rare: Skin necrosis, urticaria, anaphylaxis.[1]

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 **heparin**. Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related CAHS internal policies, procedures and guidelines

PCH Clinical Practice Manual: Subcutaneous Injections Guideline

PCH Clinical Practice Manual: Extracorporeal Membrane Oxygenation (ECMO)

PCH Clinical Practice Manual: Anticoagulation for Haemodialysis

PCH Clinical Practice Manual: CVAD and Midline Insertion and Management

PCH Paediatric Critical Care Manual: Continuous Renal Replacement Therapy (CRRT) - Heparin

References and related external legislation, policies, and guidelines

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File Path:	W:\Safety & Quality\CAHS\CLOVERS MEDICAL Pharmacy\Procedures Protocols and Guidelines\Medication Monographs_Word\PCH.MED.Heparin.docx		
Document Owner:	Chief Pharmacist		
Reviewer / Team:	Senior Pharmacist, PCC HoD, Cardiology HoD, Haematology HoD, Consultant Haematologist		
Date First Issued:	Dec 2017	**Last Reviewed:**	Sep 2024
Amendment Dates:	Sep 2021, Dec 2021, Nov 2023, Jul 2024, Sep 2024	**Next Review Date:**	Sep 2027
Approved by:	Medication Safety Committee	**Date:**	Sep 2024
Endorsed by:	Drugs and Therapeutics Committee	**Date:**	Oct 2024
Standards Applicable:	NSQHS Standards: NSMHS: N/A Child Safe Standards: N/A		

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