

HEPARIN INFUSION - CHW

DRUG PROTOCOL[®]

DOCUMENT SUMMARY/KEY POINTS

- Intravenous heparin is indicated for the initial treatment of venous or arterial thrombosis, and anticoagulation of patients with prosthetic heart valves perioperatively.
- Loading dose is 100 units/kg.
- Usual maintenance dose is 20 – 40 units/kg/hour.
- Heparin therapy is monitored using anti-Xa levels. Specify the anticoagulant being used (unfractionated heparin) on the request form.

This is ordered as “**anti Xa Unfractionated**” on PowerChart, and “Unfract Hep” selected in the dropdown for Type of Heparin.

- Monitoring by anti-Xa is available at all times for patients on ECMO.
- For patients **NOT in PICU**, monitoring by anti-Xa is available between 8am and 6pm (sample **must** be received in the laboratory by 6pm). Samples received in the laboratory at other times will be analysed only during the listed hours.
- If major haemorrhage occurs, heparin may be reversed using protamine sulphate.
- Refer to the Paediatric Injectable Medicines Handbook for administration guidelines
 - <http://injectables.webapps.schn.health.nsw.gov.au/search?q=heparin>

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st April 2024	Review Period: 1 year
Team Leader:	Staff Specialist	Area/Dept: Haematology CHW

CHANGE SUMMARY

- All heparin orders to be placed on eMR (Powerchart).
- Heparin – Anticoagulation Powerplan.
- **06/03/24: Minor review** - addition of PIMH link and administration information.

READ ACKNOWLEDGEMENT

- Clinical staff (medical and nursing) who prescribe heparin and/or administer heparin by infusion should read and acknowledge they understand the contents of this document

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1 Introduction

The aim of this drug protocol is to guide the administration of heparin by continuous intravenous infusion for anticoagulant therapy.

2 Indications, Uses and Action

2.1 Indications

- Primary or secondary prophylaxis of thrombotic and thromboembolic disorders^{1,2}.

2.2 Common Uses

- Primary prophylaxis
 - Anticoagulation of patients with prosthetic heart valves¹.
- Secondary prophylaxis
 - Initial treatment of venous or arterial thrombosis¹.
 - Initial treatment of pulmonary embolus
 - Arterial/venous obstruction after cardiac catheterisation¹.

2.3 Action

While heparin acts at multiple sites in the normal coagulation system², its major anticoagulant effect is by potentiating the activity of antithrombin III by over a 1000-fold; leading to inactivation of thrombin and activated factor X (factor Xa). Inactivation of thrombin, in turn, prevents fibrin formation and also inhibits thrombin-induced activation of platelets and factors V and VIII.³ Heparin does not have fibrinolytic activity; therefore, it will not lyse existing clots².

- Onset of action: Effect begins almost immediately.
- The clearance of heparin is dependent on age and dosage; its clearance is more rapid in young children compared to adults. At the usual maintenance dosages, heparin is cleared and coagulation returns to normal within 1 – 2 hours of ceasing the infusion.
- Metabolism is primarily via the reticuloendothelial system; however, at treatment dosages, renal clearance occurs.⁴

3 Contraindications and Precautions

Contraindications

- Severe thrombocytopenia². Heparin can rarely reduce the platelet count. If it is necessary to administer heparin then a reduced loading and maintenance dose should be given². This should be done in consultation with a Haematologist.
- Uncontrolled active bleeding except when the condition is the result of disseminated intravascular coagulation².
- Hypersensitivity to heparin².

Precautions

- Haemorrhage can occur at any site in patients receiving heparin². An unexplained fall in haematocrit/haemoglobin or a fall in blood pressure may indicate a haemorrhagic event².
- Patients with actual (or potential) bleeding sites, including recent surgical sites, cerebral haemorrhage, oesophageal varices and peptic ulceration, should be observed hourly when administering heparin².
- Do not commence intravenous heparin infusion in patients who have had lumbar puncture, epidural insertion or removal, or major surgery (especially surgery to the brain, eye and spine) before consultation between the treating physician or surgeon and a haematologist occurs. These patients should be monitored closely, including neurological observations, if they are receiving heparin infusions². Patients with renal impairment receiving heparin infusions require closer monitoring of anti-factor Xa, seek advice from the haematologist for frequency of testing.
- Consult haematologist to discuss patients with a history of coagulation disorders (thrombosis or bleeding) before commencing anticoagulant therapy
- Discontinue intravenous heparin **at least 2 hours but preferably 4 hours**, prior to invasive procedures, such as surgery, insertion or removal of epidural catheters.

3.1 Special Precautions

- The Haematologist on-call should be informed to plan for initial investigation and monitoring of treatment. Prior to administration, check coagulation screening tests which include FBC (Full Blood Count), APTT (Activated Partial Thromboplastin Time), PT (Prothrombin Time) and fibrinogen level (should be greater than 1.5 g/L)^{1, 2}.
- Intramuscular injections should be avoided in patients on heparin. Place a sign at the patient's bedside stating: **'No intramuscular injections or arterial punctures'**
- A continuous infusion must be maintained to ensure appropriate anticoagulation in view of the short half-life of heparin. The infusion must not be paused or stopped (or infusion line flushed) just prior to blood collection for monitoring.

4 Adverse Drug Reactions

Heparin has several adverse drug reactions. Some are listed below:

- **Haemorrhage with overdose:** This is a major risk of therapy¹. Haemorrhage ranges from minor local bruising to major haemorrhagic complications. Prolonged bleeding after procedures, or minor bleeding, can usually be controlled by discontinuing heparin². Significant gastrointestinal/genitourinary bleeding may indicate the presence of underlying abnormality. Adrenal haemorrhage has occurred with resulting adrenal insufficiency².
- **Osteoporosis** with long term use has been reported^{1,2}.
- **Local irritation may occur at the injection site.** If mild, this is not a contraindication to continuing heparin². However, if **skin necrosis** occurs at the injection site, this may be a harbinger of heparin induced thrombocytopenia (HIT, see below) and the haematologist on call **MUST** be notified.
- **Generalised hypersensitivity:** Chills, fever and urticaria are the most common signs². Asthma, rhinitis, headache, lacrimation, nausea, vomiting, anaphylaxis and shock rarely occur².
- **Hyperkalaemia can occur:** Patients at particular risk are those with diabetes mellitus, chronic renal failure, acidosis, raised plasma proteins and those on potassium sparing drugs. The risk increases with the duration of therapy.
- **Heparin - Induced Thrombocytopenia (HIT)** may occur with prolonged therapy and has been reported in 1-5% of adults. The incidence of HIT in children is very low and has not been fully researched^{1,2,7,8}. HIT should be suspected if, whilst on heparin therapy, the platelet count drops significantly OR a new thromboembolic event (arterial or venous) occurs OR skin necrosis at the site of injections occurs. **If HIT is suspected, the Haematologist on-call MUST be notified immediately.**

5 Interactions

Interactions with other medicines

- Platelet and coagulation inhibitors (e.g. aspirin, ibuprofen, warfarin, dabigatran) and fibrinolytic agents (e.g. tissue plasminogen activator, streptokinase) increase bleeding risk in patients receiving heparin infusions². Use of these agents with heparin should be discussed with the haematologist before commencement.
- Digoxin, tetracyclines, nicotine or antihistamines may partially counteract the anticoagulant action of heparin².

Compatibility

- Many medications are not compatible with heparin. Do not mix with other medications. Contact the Medicines Information pharmacist or your ward pharmacist for more information.

- Heparin should be given through in a dedicated line.

6 Dosage

- Prior to commencement of intravenous heparin, all patients should have baseline FBC and coagulation profile ("coags" including PT, APTT and fibrinogen).

Loading dose	100 units/kg intravenously over 30 minutes
<u>Maximum loading dose</u> according to age: <ul style="list-style-type: none">• Children less than 1 year: maximum 1500units• Children 1 year to less than 12 years: maximum 5000units• Children 12 years and older: maximum 10,000units 50 units/kg loading dose may be more appropriate for patients with higher bleeding risk eg recent surgery or major trauma.	

- **Starting maintenance dose:**
 - **< 1 year old:** start 30 units/kg/hr
 - **1 - 5 years old:** start 25 - 30 units/kg/hr (maximum 1000 units/hr)
 - **>5 years old:** 20 – 25 units/kg/hr
 - **Post Pubertal:** 20 units/kg/hr
- **Maintenance dose:** usual range is 20 – 40 units/kg/hr.
- In obese children, use ideal body weight and consult closely with Haematology since the actual weight is usually **not** appropriate for dosing calculations.
- For patients receiving ECMO - consult the ECMO Haemostasis protocol (PICU).

7 Prescription

- Order the loading dose and maintenance infusion of heparin on the eMR.
- Search for Heparin – Anticoagulation Powerplan

The screenshot shows two search results windows. The left window shows search results for 'anticoagulation' with 'Anticoagulation - Heparin Infusion' highlighted. The right window shows search results for 'heparin' with 'Anticoagulation - Heparin Infusion' highlighted. A text box in the bottom left of the screenshot contains the following text:

1. Ordering
Enter "heparin" or "anticoagulation"
Search for **Anticoagulation - Heparin Infusion**

2. Select orders

- Loading dose
- Maintenance (Continuous infusion)
- Anti Xa unfractionated heparin

*Please collect during working hours 8AM - 6PM

- Order loading dose:
 - Select EITHER 100 units/kg or 50 units/kg loading dose
- Order maintenance (continuous) infusion:
 - Heparin solutions at a concentration of 50 units/mL are available in 500mL bags or 50mL syringes
 - Heparin 25,000 units in 500mL of 0.9% sodium chloride (bag)
 - Heparin 2,500 units in 50mL of 0.9% sodium chloride (syringe)
 - Check the preferred option with nursing staff
- Check that the 'Anti Xa Unfractionated' level is ordered for an appropriate time

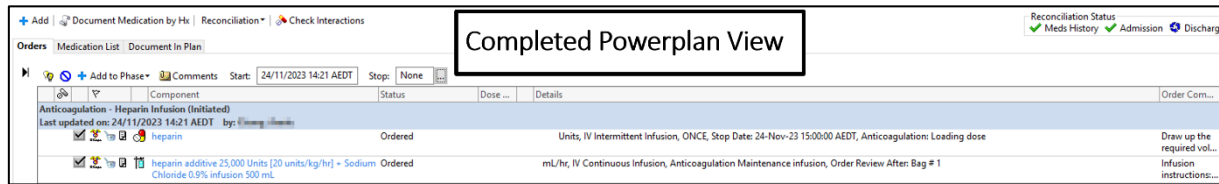
3. Select heparin solution in 500mL bag or 50mL syringe

4. Right click > Modify
Enter dose **units/kg/hr**

4. Sign
Click Orders for Signature

Base Solution	Bag Volume	Rate	Infuse Over
Sodium Chloride 0.9% infusion 500 mL			
Additive	Additive Dose	Normalized Dose	Delivers
heparin additive	25,000 Units	units/kg/hr	Every Bag
Total Bag Volume 500 mL			

- Rate changes can be performed by 'Modify'ing the "Normalised Rate" of the order on the eMR Medication List.



Special patient populations:

For populations with strict fluid restrictions (such as small infants), a more concentrated heparin solution (100 units/mL in 0.9% sodium chloride) is available and may be more appropriate. This infusion cannot be ordered through the above power plan and must be selected from the 'Orders' box in eMR. Please liaise with pharmacy to obtain supply.

8 Administration

- Refer to the Paediatric Injectable Medicines Handbook for administration guidelines
<http://injectables.webapps.schn.health.nsw.gov.au/search?q=heparin>

Administer loading dose

- Volume of heparin required (mL):
 = Required dose (units) ÷ Strength of Heparin solution (units/mL)

Example of Calculation for 12 kg child:

(using heparin ampoules with 5000 units in 5 mL)

- Required dose = 100 units/kg x 12kg = 1200 units
- Volume of heparin required (mL):
 = 1200 units ÷ 5000 units/5mL
 = 1200 units ÷ 1000 units/mL $\left(= \frac{1200 \text{ units}}{1000 \text{ units/mL}} \right)$
 = 1.2mL

Therefore 1.2mL of 5000 units/5mL heparin solution = 1200 units (diluted in 10 mls NS/G5W)

Administer the loading dose over 30 minutes.

1. Go To MAR

23 November 2023 14:25 AEDT - 25 November 2023 14:25 AEDT (Clinical Range)

Time View	Medications	24/11/2023 10:34 AEDT	24/11/2023 10:35 AEDT	24/11/2023 10:59 AEDT	24/11/2023 14:25 AEDT	24/11/2023 15:00 AEDT
Scheduled	Scheduled					
Unscheduled	heparin					Units Last given: 24/11/2023 10:34 AEDT
PRN	Units, IV Intermittent Infusion, ONCE, Stop Date: 24-Nov-23 15:00:00 AEDT, Anticoagulation: Loading dose Draw up the required volume of heparin, dilute with NaCl 0.9% to 10mL in a syringe and administer intravenously over 30 minutes...					
Continuous Infusions	heparin					
Future	Anti Xa UF					
Discontinued Scheduled	APTT					
Discontinued Unscheduled	Unfractionated Heparin Anti Xa Target					
Discontinued PRN	Prescribed unfractionated heparin dose					
Discontinued Continuous Infusions	Unfractionated Heparin Anti Xa-SCH					
	APTT-SCH					
	Continuous Infusions					
	heparin additive 25,000 Units [units/kg/hr] Sodium Chloride 0.9% infusion 500 mL mL/hr, IV Continuous Infusion, Anticoagulation Maintenance infusion, Order Review After: Bag # 1 Infusion instructions: Standard concentration infusion: Heparin 25,000 units in sodium chloride 0.9% 500mL bag (50 units/mL). Mai...					Pending Not given within 5 days.
	Administration Information					
	heparin					
	Sodium Chloride 0.9% infusion					

Prescribed dose indicated here

Prescribed dose indicated here

2. To administer loading dose:
 Select due dose task tile

Medications	24/11/2023 10:34 AEDT	24/11/2023 10:35 AEDT	24/11/2023 10:59 AEDT	24/11/2023 14:28 AEDT	24/11/2023 15:00 AEDT
Scheduled					
heparin					Units Last given: 24/11/2023 10:34 AEDT
Units, IV Intermittent Infusion, ONCE, Stop Date: 24-Nov-23 15:00:00 AEDT, Anticoagulation: Loading dose Draw up the required volume of heparin, dilute with NaCl 0.9% to 10mL in a syringe and administer intravenously over 30 minutes...					
heparin					
Anti Xa UF					
APTT					
Unfractionated Heparin Anti Xa Target					
Prescribed unfractionated heparin dose					
Unfractionated Heparin Anti Xa-SCH					
APTT-SCH					

3. Fill in details:

- Diluent
- Volume to infuse
- Site of administration
- Infuse over 30 minutes

Signature from administrator & witness

In the example shown here, the loading dose is 2000 units of heparin

*Performed date / time : 24/11/2023 1430 AEDT

*Performed by : Test, Nurse-OrderMeds

*Witnessed by : Test, Nurse-OrderMeds (Test Account)

*heparin: 2,000 Units Volume: 0 ml

Diluent : Sodium Chloride 0.9% infu ml

*Route : IV Intermittent Infusion Site : CVC - Red Lumen

Total Volume: 10 Infused Over: 30 minute(s)

Start continuous infusion immediately after loading dose:

Medications	24/11/2023 10:34 AEDT	24/11/2023 10:35 AEDT	24/11/2023 10:59 AEDT	24/11/2023 14:28 AEDT	24/11/2023 14:33 AEDT
Continuous Infusions heparin additive 25,000 Units [20 units/kg/hr] Sodium Chloride 0.9% infusion 500 mL 8 mL/hr, IV Continuous Infusion, Anticoagulation Maintenance infusion, Order Review After: Bag # 1 Infusion instructions: Standard concentration infusion: Heparin 25,000 units in sodium chloride 0.9% 500mL.					Pending Not given within 5 days.

4. To start **continuous infusion**:
 Go To "Continuous Infusions"
 Select Pending task tile

In the example shown here, the rate is 20 units/kg/hr = 8mL/hr

heparin additive 25,000 Units [20 units/kg/hr] + Sodium Chloride 0.9% infusion 500 mL
 8 mL/hr, IV Continuous Infusion, Anticoagulation Maintenance infusion, Order Review After: Bag # 1
 Infusion instructions: Standard concentration infusion: Heparin 25,000 units in sodium chloride 0.9% 500mL.

24/11/2023 02:39 AEDT - 25/11/2023 02:39 AEDT

- Begin Bag
- Infuse
- Bolus
- Waste
- Rate Change
- heparin

5. Click "Begin Bag"
 Fill in site of administration
 Signature from administrator & witness

In the example shown here, the rate is 20 units/kg/hr = 8mL/hr

Yes No heparin additive 25000 Units
 Yes No Sodium Chloride 0.9% infusion 500 mL

*Performed date / time : 24/11/2023 1439 AEDT
 *Performed by : Test, Nurse-OrderMeds (Test Account)
 *Witnessed by :
 *Bag # : 1
 *Site : CVC - Red Lumen
 *Volume (mL) : 500
 *Rate (mL/hr) : 8
 *heparin Dose : 20 units/kg/hr
 *Weight : 20 kg

Begin Bag

Medications	24/11/2023 10:34 AEDT	24/11/2023 10:35 AEDT	24/11/2023 10:59 AEDT	24/11/2023 14:28 AEDT	24/11/2023 14:43 AEDT	24/11/2023 14:44 AEDT
Continuous Infusions heparin additive 25,000 Units [20 units/kg/hr] Sodium Chloride 0.9% infusion 500 mL 8 mL/hr, IV Continuous Infusion, Anticoagulation Maintenance infusion, Order Review After: Bag # 1 Infusion instructions: Standard concentration infusion: Heparin 25,000 units in sodium chloride 0.9% 500mL. bag (50 units/mL). Mai...						Pending Last bag started: 24/11/2023 14:43 AEDT
Administration Information heparin Sodium Chloride 0.9% infusion					Begin Bag 500 mL 20 units/kg/hr	

9 Monitoring

9.1 Observations

- 4th hourly observations – pulse, respirations, temperature and blood pressure (more frequent if condition warrants it).
- Hourly infusion observations to ensure prescribed volume is being delivered.
- Hourly intravenous injection site checks as per [Intravenous Cannulation and Venepuncture Procedure](#).
 - Identify IV leaks or tissue cannulas as soon as possible because heparin has a short half life.
 - Delay in re-establishing IV access will lead to inadequate anticoagulation.
 - Do not pause or stop heparin infusion to administer other IV medications.
- Neurological observations (as per precautions section) as required for specific patients.
- Report to Medical Officer any evidence of bleeding from any site.

9.2 Laboratory Monitoring

- The anti-factor Xa **UFH** is the preferred assay to monitor the anticoagulant effect of unfractionated heparin.
- Seek advice from the haematology registrar / haematologist on-call for the timing and frequency of testing.
- The blood sample for anti-Xa should be collected peripherally or from a heparin-free line.
- The usual therapeutic range for **anti-Xa is 0.3-0.7units/mL** when unfractionated heparin is used for anticoagulation.
- Seek advice from the haematology registrar / haematologist on-call if dosage adjustments are required.
- For patients **NOT in PICU**, monitoring by anti-Xa is available between 8am and 6pm (sample **must** be received in the laboratory by 6pm). Samples received in the laboratory at other times will be analysed only during the listed hours.
- The anticoagulant being used (i.e. unfractionated heparin) **must** be specified on the Pathology request. This can be ordered as “anti Xa Unfractionated” on PowerChart, and “Unfract Hep” selected in the dropdown for Type of Heparin.
- After 5 days of treatment the platelet count should be monitored twice weekly.

9.3 Overdose

- Slight overdose can be managed by ceasing the heparin infusion^{2,6}.
- All cases of severe bleeding should be discussed with the Haematologist on-call.
- In severe bleeding, heparin can be reversed with intravenous protamine sulphate after consultation with the Haematologist.
- Protamine sulphate provides an immediate effect with neutralisation of unfractionated heparin within 5 minutes.
- Protamine sulphate should be used with caution and administered only after coagulation studies and FBC have been collected².
- Excessive protamine sulphate can have an anticoagulant effect.
- Resuscitation equipment should be readily available before administration of protamine sulphate ². Protamine sulphate can cause severe hypotension and anaphylaxis². Adverse reactions of protamine sulphate are:
 - hypotension,
 - bradycardia,
 - pulmonary and systemic hypertension,
 - dyspnoea,
 - back pain,
 - nausea and vomiting².

Protamine Dose⁹

Time Since Last Heparin Dose (minutes)	Protamine dose (mg) per 100 units heparin (per 100units heparin received in the previous 2 hours)
<30	1
30 - 60	0.5 – 0.75
60 - 120	0.375 – 0.5
>120	0.25 – 0.375

- The maximum dose of protamine sulphate is 50mg per dose (except in cardiopulmonary bypass).
- Protamine sulphate is usually administered at a concentration of 10mg/mL.
- The rate should not exceed 5mg/minute and should be longer than 10minutes (whichever is slower).
- If administered too quickly it may cause cardiovascular collapse.
- Patients with known hypersensitivity to fish, and those who have received protamine containing insulin or previous protamine therapy are at risk of hypersensitivity reactions.
- Obtain blood for PT and APTT 15minutes after the administration of protamine sulphate.

10 References

1. Nathan, D.G. Orkin, S.H. Ginsberg, D. Look, A.T. (2003). Nathan and Oski's Hematology (sic) of Infancy and Childhood. 6th Edition. Philadelphia: Saunders. An imprint of Elsevier.
2. MIMS On-line. <http://mims.hcn.net.au> <Accessed 23rd June 2011>
3. Hirsh, J., et al. Mechanism of action and pharmacology of unfractionated heparin. *Arteriosclerosis, Thrombosis, Vascular Biology*, 2001;21:1094-1096
4. Baglin T, Barrowcliffe TW, Cohen A, Greaves M for the British Committee for Standards in Haematology. Guidelines on the use and monitoring of heparin. *BJH*. 2006; 133: 19-34.
5. Wong, D.L. Hockenberry, M.J. Wilson, D. Winkelstein, M.L. Kline, N.E. (2003) Nursing care of infants and children. 7th Edition. St Louis: Mosby. An affiliate of Elsevier Science.
6. Miller, P. (2003). Heparin induced thrombocytopenia Recognition and treatment. *The Association of Perioperative Registered Nurses (AORN)*. Vol 78(1):79-86, 89. <http://gateway.ut.ovid.com/gw2/ovidweb.cgi> <Accessed 23rd June 2011>
7. Newall, F. Barnes. C. Ignjatovic, V. Monagle, P. (2003). Heparin – Induced Thrombocytopenia in children. *Journal of Paediatrics and Child Health*. Vol 39(4):289-292. Blackwell Publishing. <http://gateway.ut.ovid.com/gw2/ovidweb.cgi> <Accessed 23rd June 2011>
8. Comunale, M.E. Van Cott, E. (2004). Heparin – Induced Thrombocytopenia. *International Anesthesiology (sic) Clinics*. Vol 42(3):27-43. Lippencott Williams and Wilkins Inc. [Http://gateway.ut.ovid.com/gw2/ovidweb.cgi](http://gateway.ut.ovid.com/gw2/ovidweb.cgi) <Accessed 23rd June 2011>
9. Website of the Royal Children's Hospital at Melbourne. www.rch.org.au/pharmacopoeia/pages/guideAnticoag.html <Accessed 3 March 2009, authorisation required>

Bibliography:

- Haemostasis and Thrombosis Task Force. The use and monitoring of heparin. In: Wood, K. editor. (1994). *Standard Haematology Practice 2*. Blackwell Science Ltd. pp150-165.

11 Appendix (Only if premade solutions are not available)

Preparation:

- Use the 5000units/5mL ampoules and dilute with a compatible solution.
- Heparin is compatible with NaCl 0.9% and 5% glucose.
- Heparin is infused via intravenous infusion pump or syringe pump (utilise drug library parameters for additional safe administration).

11.1 Loading dose

100 units/kg is equivalent to 0.1mL/kg of 5000 units/5mL heparin solution. Draw up the required volume of solution in a syringe and given intravenously over 30 minutes. This does not need to be diluted but may be diluted for ease of administration with up to 10mL Sodium Chloride 0.9%. The heparin loading dose should be prescribed on eMR.

Loading dose of heparin:

- Dose: 100 units/kg
- Volume of heparin required (mL):
= Required dose (units) ÷ Strength of Heparin solution (units/mL)

Example of Calculation for 12 kg child:

(using heparin ampoules with 5000 units in 5 mL)

- Required dose = 100 units/kg x 12kg = 1200 units
- Volume of heparin required (mL):
= 1200 units ÷ 5000 units/5mL
= 1200 units ÷ 1000 units/mL $\left(= \frac{1200 \text{ units}}{1000 \text{ units/mL}} \right)$
= 1.2mL

Therefore 1.2mL of 5000 units/5mL heparin solution =1200 units (diluted if necessary)

Administer the loading dose over 30 minutes.

Intravenous Heparin infusion dilution for maintenance treatment:

Note: The preferred heparin dilution is 500 units/kg in 500mL (1 unit/kg/mL), whenever appropriate. However, in small children (< 15 kg), patients on fluid restriction or those with multiple infusions e.g. a patient in ICU, a more concentrated heparin solution (10 units/kg/mL) may be used.

- If 500 units/kg (0.5mL/kg of 5000 units/5mL) is made up to 500mL of compatible solution, the concentration of this solution is 1 unit/kg/mL.
- If 500 units/kg (0.5mL/kg of 5000 units/5mL) is made up to 50mL of compatible solution, the concentration of this solution is 10 units/kg/mL.

- Premature infants and neonates in Grace ward: If 1250 units/kg (1.25mL/kg of 5000 units/5mL) is made up to 50mL of compatible solution, the concentration of this solution is 25 units/kg/mL.

Maintenance heparin dose:

- Usual dose range: 20 – 40 units/kg/hr

Children > 15 kg:

- Add 500 units/kg into 500mL of a suitable solution, so
1 unit/kg/hr = 1mL/hr
10 units/kg/hr = 10mL/hr
25 units/kg/hr = 25mL/hr

Children ≤ 15 kg and for patients requiring fluid restriction:

- Add 500 units/kg into 50mL of a suitable solution, so
10 units/kg/hr = 1mL/hr
25 units/kg/hr = 2.5 mL/hr

Example of calculation for 12 kg child with a maintenance dose of 25 units/kg/hr

(using heparin ampules with 5000 units in 5mL)

Making infusion solution:

- Units of heparin required = 500 units x weight (kg)
500 units x 12kg = 6000 units
- Volume of heparin required (mL):
= Required dose (units) ÷ Strength of Heparin solution (units/mL)
= 6000 units ÷ 5000 units/5mL
= 6000 units ÷ 1000 units/mL $\left(= \frac{6000 \text{ units}}{1000 \text{ units/mL}} \right)$
= 6mL

Therefore 6mL of 5000 units/5mL heparin solution = 6000 units.

Add this volume of heparin to a suitable solution (see below) to make up a total volume of 50mL (e.g. 44mL of normal saline).

Concentration of solution is 10 units/kg/mL, i.e. 1mL/hr = 10 units/kg/hr

1. Calculating infusion rate:

Infusing solution is 1mL/hr = 10 units/kg/hr

Therefore, infusion rate for 25 units/kg/hr = 2.5mL/hr

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