DOPAMINE OR DOBUTAMINE INFUSIONS OUTSIDE ICU – SCH

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- Dopamine can be used to aid in the correction of haemodynamic imbalance that is present in acute hypotension, or shock associated with septicaemia, trauma and renal failure. It can also be used as an adjunct to treatment where low blood pressure persists despite adequate circulating volume.
- Dopamine and dobutamine infusions outside CICU may only commence after the Senior Medical Officer has consulted with the CICU Director, Nursing Unit Manager or his/her representative and the Clinical Director - Nursing or After Hours Hospital Co-ordinator.
- Patients must be cared for in the most appropriate environment, taking into consideration the patient's condition and the level of nursing care required and available.
- The **maximum dose on wards outside CICU should not exceed 10microg/kg/min.**
- Only registered nurses who are IV accredited and have completed the dopamine & dobutamine learning and assessment plan will administer and care for a patient on a dopamine or dobutamine infusion
- If a patient is cared for in ward area other than C2S, the Cardiology/Cardiothoracic CNC should be contacted
- Dopamine must be given via a CVAD on a dedicated line via an Alaris CC (critical care) syringe pump
- For safety, the hard maximum concentration in Guardrails is 10mg/mL

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st January 2015	**Review Period**: 3 Years
Team Leader:	Patient Safety and QUM Pharmacist	**Area/Dept**: SCH Pharmacy

Date of Publishing: 23 December 2014 11:28 AM Date of Printing: 23 December 2014

CHANGE SUMMARY

- SCH document due for mandatory review. Rescinds SCH Document C.5.12
- Insertion of information regarding hard maximum concentration in Guardrails
- Formula clarification for infusions
- Advice re contacting Cardiology CNC for cardiac patients cared for outside C2S
- Modification to mechanisms of action
- Clarification of recommended frequency of monitoring blood pressure.

READ ACKNOWLEDGEMENT

- **Training/Assessment Required:**
  - Registered nurses must have successfully completed the dopamine & dobutamine learning and assessment plan before they can administer and care for a patient on a dopamine or dobutamine infusion.
- **Read and Acknowledge:**
  - The following staff should read and acknowledge that they understand the contents of this document:
    - All Nursing Staff administering intravenous dopamine/dobutamine solutions outside of CICU
    - All Medical Staff involved in the prescription and administration of dopamine/dobutamine solutions
    - All Pharmacy Staff

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Purpose & Scope

Dopamine and dobutamine provide effective pharmacologic support in patients with cardiovascular collapse. The use of these drugs should be dictated by their dose-related pharmacological actions and the aetiology of the cardiovascular compromise.

Responsibilities (& definitions)

- **Senior Medical Officer** (SMO) must review the patient and order a dopamine or dobutamine infusion
- **Junior Medical Officer** (RMO or Registrar) must be present at the commencement of the dopamine or dobutamine infusion and remain until the patient's condition is considered stable. The JMO must review the patient at least once per shift and communicate with the SMO who ordered the infusion of any change in the patient's condition.
- **Registered Nurses** (RN) – Only IV accredited Registered Nurses who have completed the dopamine & dobutamine learning and assessment plan will administer and care for a patient on a dopamine or dobutamine infusion
- **Enrolled Nurses** (EN), **Trainee Enrolled Nurses** (TEN) and student nurses **must not perform** tasks involving dopamine or dobutamine infusions.

Indications for use

Dopamine can be used to aid in the correction of haemodynamic imbalance that is present in acute hypotension, or shock associated with septicaemia, trauma and renal failure. It can also be used as an adjunct to treatment where low blood pressure persists despite adequate circulating volume.

Mechanisms of Action

The cardiovascular responses to dopamine and dobutamine depend on the concentration infused. Activation of alpha receptors in the smooth muscle of blood vessels supplying skeletal muscle cause vasoconstriction; activation of beta - 2 receptors in the same tissue results in vasodilatation. The alpha receptor has a higher stimulation threshold thus lower doses only cause beta stimulation, with alpha stimulation starting at rates above 5microg/kg/min and becoming increasingly prominent above 10microg/kg/min.

Dopamine:

- Infusions less than 5microg/kg/min result in dopaminergic stimulation producing dilatation in renal, coronary, mesenteric and intra-cerebral vascular beds with little effect on heart rate or blood pressure and are not of clinical significance.

- Infusions of 5 -10microg/kg/min stimulate beta-1 adrenergic receptors which increase the rate and contractility of the heart and augment the cardiac output. Systolic BP is increased and diastolic BP is either slightly increased or unchanged. The favourable dopaminergic effects of the low dose regime (<5microg/kg/min) are preserved as the dose is raised.
- Infusions greater than 10microg/kg/min causes an alpha-receptor stimulation that results in vasoconstriction in most vascular beds. Total peripheral resistance increases resulting in an increase in BP. If concentration reaching the tissues is high enough, vasoconstriction of the renal vascular beds also occurs.

Drug	Effects	Indications	Side effects
Dopamine *2-5mirog/kg/min*	Renal & mesenteric vasodilatation	Low CO + normotensive	Minimal
Dopamine *5-10 microg/kg/min*	↓ venous capacitance ↑ myocardial contractility and SVR	Low CO + hypotensive	Tachycardia, tachyarrhythmias Hypokalaemia ↑ myocardial O_2 demand
Dopamine *greater than10 microg/kg/min*	↓ venous capacitance ↑ myocardial contractility and SVR ↑ PVR		

Dobutamine:

Dobutamine is structurally related to dopamine and possesses a favourable spectrum of beta -1 effects and has only mild effects on the beta-2 or alpha receptors. Although it preferentially dilates the coronary beds, it does not activate dopaminergic receptors and causes no renal and mesenteric vasodilatory effects.

Dobutamine tends to improve renal blood flow by increasing cardiac output rather than by activating renal dopaminergic receptors. In the spectrum of beta 1 and beta 2 effects, dobutamine resembles dopamine. It has less of a tendency to cause arrythmias and causes less of an increase in systemic vascular resistance than dopamine.

Drug	Effects	Indications	Side effects
Dobutamine	↑ myocardial contractility and stroke volume and causes peripheral vasodilatation ↓SVR ↑CO	Low CO + normotensive Cardiogenic shock	Tachycardia at higher doses Tachyarrhythmias

NOTE: The administration of intravenous dopamine or dobutamine is not to be considered as routine outside the Children's Intensive Care Unit.

Any child requiring infusions greater than 10microg/kg/min must be admitted to CICU.

Administration

1. Dopamine infusions must only be administered via a central venous line as vasoconstriction, tissue sloughing and necrosis can occur.
2. Dopamine or dobutamine infusions must be prescribed in accordance with (Safe Prescribing Guidelines - SCH) and the dose of dopamine or dobutamine documented in microg/kg/min.

> **PLEASE NOTE**: The maximum dose on wards outside CICU should not exceed 10microg/kg/min

3. Dopamine or dobutamine infusions may only be administered by RNs that have been accredited to administer intravenous drugs. In addition, the RN caring for a patient receiving a dopamine or dobutamine infusion must have successfully completed the relevant Learning and Competency Assessment Plan (NE.08 Dobutamine or Dopamine Outside CICU).
4. Dopamine or dobutamine infusions must be administered in accordance with (Non-Cytotoxic Injectable Medication (IV, IM, SC) - SCH), (Intravenous Fluid and Electrolyte Therapy – SCH) and (Central Venous Access Devices (CVAD)).
5. The formula for calculating the standard dilution of Dopamine is:

Patients Under 16.66kg:

15 X weight (kg) = No. of milligrams made up to 50 mL in a syringe

1 mL/hour = 5microg/kg/minute.

Patients over 16.66kg:

250mg made up to 50mL in a syringe = 5 mg per mL

To calculate the rate in microg/kg/min:

Dose in Syringe (mg) ÷ volume in syringe (mL) ÷ patient's weight (kg) ÷ 60(minutes) x 1000, then multiply by infusion rate (in mL/hr)

Example: Based on a 31kg patient with infusion running at 1mL/hr

250mg ÷ 50mL ÷ 31kg ÷ 60min x 1000 x 1mL

1 mL/hr = 2.68microg/kg/minute

* See: ***The Paediatric Injectable Guidelines*** for maximum concentration for compatibility information [7]

6. Dopamine or dobutamine infusions must be administered via a dedicated line ie no other infusion must be co-infused via this line. Both dopamine and dobutamine infusions are incompatible with alkaline solutions eg Na HCO_3 and many medications e.g. antibiotics.
7. The dopamine or dobutamine infusion must be clearly labelled "Dopamine (or Dobutamine) Infusion" and must be administered using an Alaris CC (critical care)

syringe pump. Under NO circumstances is an Alaris GH (general hospital) syringe pump to be used for a dopamine (or dobutamine) infusion.

8. A Medical Officer must be present at the commencement of the dopamine or dobutamine infusion and remain until the patient's condition is considered stable.
9. The patient's acceptable cardiovascular parameters are to be documented in the medical records by the Senior Medical Officer. If any alteration in the patient's condition occurs or if these parameters are not maintained, the Senior Medical Officer is to be contacted immediately and the patient reviewed.
10. Prior to the commencement of any dopamine or dobutamine infusion, baseline observations are to be recorded.
11. Continuous cardiac monitoring and pulse oximetry is to be utilised on all patients receiving dopamine or dobutamine infusions.
12. Blood pressure and pulse to be recorded every hour for first 12 hours or as documented by a medical officer
13. Accurate recording of fluid balance must occur with particular attention to urine output.
14. Insertion of an IDC may be necessary to achieve accurate urine output monitoring. If an adequate urine output (1.0mL/kg/hr) is not evident, a medical officer must be informed.
15. Common side effects of dopamine or dobutamine infusions include hypotension, hypertension, anxiety and tachycardia.

    Other reported effects may include palpitations, nausea, vomiting, headache and dyspnoea, bradycardia, peripheral cyanosis, anginal pain and ectopic beats. If any of these symptoms are evident they must be documented and reported immediately to the medical officer.
16. The patient must be medically reviewed at least once per shift or more frequently as required according to the clinical condition.
17. Dopamine or dobutamine infusions are not to be ceased abruptly but should be weaned.

    The weaning regime is to be documented by the medical officer and during this weaning phase the patient closely observed.
18. Once the infusion is ceased, precautions must be taken to ensure that any future infusions administered through the central line do not result in an inadvertent bolus of residual dopamine or dobutamine. This can be achieved by administering the prescribed flush ordered by the medical officer at a rate of 2mL/ hr for the first hour after the infusion has been ceased.

Outcome

Infusions of dopamine and dobutamine are administered in areas outside CICU in a manner that maximises patient care and minimises potential complications.

Related Documents

- Central Venous Access Devices (CVAD) http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2013-9037.pdf
- Intravenous Fluid and Electrolyte Therapy – SCH http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2013-7033.pdf
- Non-Cytotoxic Medication Administration – SCH (in draft)
- Non-Cytotoxic Injectable Medication (IV, IM, SC) – SCH (in draft)
- Safe Prescribing Guidelines – SCH http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2012-7007.pdf

References

1. Hoffman, T. (2011) Newer Inotropes in Pediatric Heart Failure. Journal of Cardiovascular Pharmacology 58 (2):121–125)
2. Cooper, B.E. (2008) Review and Update on Inotropes and Vasopressors. AACN Advanced Critical Care 19 (1), 5–15
3. Senz, A. and Nunnink, L. (2009) Review article: Inotrope and vasopressor use in the emergency department. Emergency Medicine Australasia 21, 342–351
4. Turner, M.A. and Baines, P. (2011) Which inotrope and when in neonatal and paediatric intensive care? Archives of Disease in Childhood Education and Practice; 96:216–222
5. Patwardhan, K. (2009) Infant 5(1): 12-17. Inotropes in term neonates
6. Noori, S. and Seri, I. (2012) Neonatal Blood Pressure Support: The Use of Inotropes, Lusitropes, and Other Vasopressor Agents. Clinics in Perinatology 39 :221–238
7. Royal Children's Hospital Pharmacy Department. (2011) Paediatric Injectable Guidelines (4th ed). Royal Children's Hospital Melbourne.