Drug Guideline Title: Dobutamine

Summary: Dobutamine is a synthetic catecholamine that stimulates beta receptors of the heart to produce mild chronotropic, hypertensive, arrhythmogenic and vasodilative effects. It is used in the ICU for acute heart failure, cardiogenic shock, pulmonary oedema and to increase cardiac output.

Approved by: ICU Director

Publication (Issue) Date: May 2014

Next Review Date: May 2017

Replaces Existing Drug Guideline: Dobutamine


1. Introduction:
The risk addressed by this policy:

Patient Safety

The Aims / Expected Outcome of this policy:

Dobutamine will be administered safely and appropriately without any adverse side effects.

Related Standards or Legislation

- NSQHS Standard 1 Governance
- National Standard 4 Medication Safety

Related Policies
- LH_PD2013_C03.01 Drug Administration
- LH_PD2010_C03.00 Drug Prescribing
- LH_PD2008_C03.12 Administration of IV Medication
- LH_PD2012_C03.05 Accountable Drugs – Schedule 8 (S8) and S4D

2. Policy Statement:
- All care provided within Liverpool Hospital will be in accordance with infection control, manual handling and minimisation and management of aggression guidelines.
• Medications are to be prescribed and signed by a medical officer/authorised nurse practitioner (NP) unless required during an emergency.
• All drugs administered during an emergency (under the direction of a medical officer/authorised nurse practitioner) are to be documented during the event, then prescribed and signed following the event.
• Medications are to be given at the time prescribed (as close to the time as is possible when multiple drugs require ‘same time’ administration and, when the nurse is caring for more than one patient, recognition is given to a possible short delay to administration – antibiotics and other lifesaving drugs are to be prioritised) and are to be signed by the administering nurse.
• Parenteral medication prescriptions and the drug are to be checked with a second registered or endorsed enrolled nurse prior to administration. The “rights of drug administration” must be followed: right: patient, drug, dose, route, administration, time, reason for the drug, documentation, education and evaluation/outcome.
• Adverse drug reactions are to be documented and reported to a medical officer.
• Medication errors are to be reported using the hospital electronic reporting system: IIMS.
• Guidelines are for adult patients unless otherwise stated
• Dobutamine infusions may be titrated or weaned by an accredited Registered Nurse.
• Dobutamine infusions are not to be purged / bolused.
• Medical Officers must ensure that titration and/or weaning parameters are specified on the management plan, and have been discussed with the nurse assigned to that patient.
• Dobutamine may be administered via a peripheral cannula or central line.
• Dobutamine MUST ALWAYS be administered via a dedicated lumen, and never “piggybacked” with other drugs or fluids. Where multiple infusions are required, it may be acceptable to administer dobutamine with other inotropes, via a three-way tap.
• Dobutamine infusions must be administered by syringe pump or infusion pump.

For the purposes of this Policy, an accredited RN is: a Registered Nurse (RN) who has completed the required self directed learning packages and has been accredited by a Clinical Nurse Educator / Consultant with the inotrope competency tool, to administer/titrater inotropic drugs when caring for an Intensive Care Unit (ICU) Patient. The Educator/Clinical Nurse Consultant may deem the nurse competent if the nurse has previous documented experience/qualifications.

3. Principles / Guidelines

Actions¹,²,³
• Dobutamine is a synthetic catecholamine and a direct acting inotrope.
• It stimulates the beta (β) receptors in the heart and produces mild chronotropic, hypertensive, arrhythmogenic and vasodilative effects.
• β-1 stimulation results in an increase in heart rate (mild), myocardial contractility and excitability.
• β-2 stimulation is minimal – may have some peripheral vasodilatation and bronchodilation.
• The onset of action is within 1-2 minutes, but with an infusion it may take up to 10 minutes to obtain the peak effect.

Indications¹,²,³
• Acute heart failure
• Cardiogenic shock
• To reduce preload and afterload in cardiogenic pulmonary oedema.
• To increase cardiac output, improve contractility and oxygen delivery.
Contraindications\textsuperscript{1,2,3}

- Hypovolaemia
- Idiopathic hypertrophic subaortic stenosis
- Allergy to sulphites
- Hypersensitivity
- Previous anaphylactic reaction to dobutamine or any component of the preparation

Precautions\textsuperscript{1,2,3}

- In patients who are given beta-adrenergic receptor agonists the potency of dobutamine may be decreased. This could potentiate the alpha agonist effects such as hypertension and vasoconstriction. On the contrary, alpha-adrenergic blockade may make the beta1 and beta 2 effects apparent, resulting in tachycardia & vasodilatation.
- No improvement may be observed in the presence of severe valvular aortic stenosis.
- Serum potassium levels should be monitored as dobutamine like other beta-agonists can produce mild reduction in potassium concentration.
- As with any inotrope, ECG and blood pressure should be continuously monitored during administration of dobutamine.
- Dobutamine contains sodium metabisulfite, which may cause an allergic response in patients with asthma.
- Hypovolemia should be corrected before treatment with dobutamine is commenced.
- Digoxin preparations should be administered prior to dobutamine when there is atrial fibrillation with a rapid ventricular response.
- Dosage should be titrated to avoid excessive increases in heart rate and systolic blood pressure.

Significant Interactions\textsuperscript{4}

- Concomitant use of dobutamine and nitroprusside results in a higher cardiac output and, usually, a lower pulmonary wedge pressure than when either drug is used alone.
- Small studies indicate that patients with heart failure treated with dobutamine and glyceryl trinitrate will have, lower pulmonary wedge pressure than when just using dobutamine & higher cardiac output than when just using glyceryl trinitrate.

Adverse Effects\textsuperscript{1,2,3,4}

- Tachycardia and increase in systolic blood pressure that may be dose related.
- Increasing VEB’s in 5% of patients.
- Hypotension
- Phlebitis may occur with infiltration into the tissues.
- 1-3% of patients treated have experienced nausea, headache, angina, nonspecific chest pain, palpitations, shortness of breath, skin rash, fever, eosinophilia bronchospasm & isolated cases of thrombocytopenia.
- Mild reduction in serum potassium concentrations.

Presentation\textsuperscript{2}

- Dobutamine 250mg vial (Protect from Light)

Administration Guidelines\textsuperscript{5,3,4,5}

- Reconstitute vial with 10 mLs of water for injection, 0.9% sodium chloride should not be used to reconstitute vial but may be used for further dilution.
- Add 250mg dobutamine to 40mLs sterile 0.9% sodium chloride, to give a final volume of 50mL and final concentration of 5mg/mL, or 5000 micrograms/mL.
• Desired dose range is 2.5-15 micrograms/kg/minute

**To calculate rate:**

Dose (microgram/kg/min) x weight x 60) ÷ strength (micrograms/ml) = rate (ml/hr)

*Example:* 2.5 microgram/kg/min x 100 kg x 60 = 15 000 ÷ 5000 microgram/ml = 3 ml/hr

**To calculate dose:**

Strength (micrograms/ml) x rate (ml/hr) ÷ weight ÷ 60 = dose (microgram/kg/min) delivered

*Example:* 5000 x 3 ÷ 100 kg ÷ 60 = 2.5 micrograms/kg/min

• Titrate the infusion using parameters which have been discussed and documented on the management plan with the Medical Officer; including:
  ♦ Mean arterial blood pressure
  ♦ Cardiac index
  ♦ Pulmonary capillary wedge pressure (PCWP)
  ♦ Systemic vascular resistance

• If necessary, increase the infusion by 1 microgram/kg/min every 5 minutes, while closely monitoring the patient for the desired effect.

• Hypotension may follow the administration of dobutamine due to the β-2 mediated vasodilation.

• Added volume as fluid bolus may be needed to maintain an adequate preload. If patient has invasive hemodynamic monitoring such as PA catheter or PiCCO then titrate the volume loading to the measured filling pressures.

**Clinical Considerations**

• Use of dobutamine may produce mild reduction in serum potassium, monitor electrolyte levels, replace potassium as indicated.

• Continuous monitoring of ECG and blood pressure is necessary during administration of dobutamine.

• When clinically indicated invasive hemodynamic monitoring with a pulmonary artery catheter or PiCCO should be used to measure cardiac output /index, filling pressure, SVR and workload of the heart.

• Because of its short half-life, it must be administered as a continuous infusion.

• Daily 12-lead ECG should be attended.

• Strict fluid balance should be maintained and daily weight attended.

**Weaning**

• Commenced when the patient has been stable for approximately 24 hours or as clinically indicated.

• Wean the rate of infusion to desired parameters, while observing the patient closely for signs of deterioration, especially recurrent pulmonary oedema.

• Weaning dobutamine at a low dose may be facilitated by administration of alternative agent, for example, commencing oral agents such as ACE inhibitors.

**4. Performance Measures**

All incidents are documented using the hospital electronic reporting system: IIMS and managed appropriately by the NUM and staff as directed.

**5. References / Links**


Author: CNC – ICU (S. Shunker);
Reviewers: ICU – CNC, CNE, NM, NUM, Staff Specialists, CNS ‘s, Medical Director, Pharmacist
Endorsed by: A/ Proff M. Parr, Director ICU.
### Appendix 1 – Dobutamine Rate Calculation Table, correct to 1 decimal place

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Taken from Fairfield Hospital, (2013). Clinical Policy Manual: DOBUTAMINE.
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