University College London Hospitals NHS

NHS Trust

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Double pumping of intravenous vasoactive drugs in the critical care setting.

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Distribution/ availability	Local policy folder
Professional Groups consulted on Guideline	UCLH Joint Critical Care
Related documents/ policies	Critical care nurses
Which patients does the guideline apply to?	Critical care patients requiring continuous infusions of inotropes.
Implications of the Race Equality duties for the policy/strategy	This policy must be implemented fairly and without prejudice whether on the grounds of race, gender, sexual orientation or religion.

Version Control Summary

Version	Date	Status	Comments/Changes
1.0	September 2005		Revision of first draft after review of feedback from first draft
1.1	October 2005		

1. Introduction

1.1 This guideline aims to define a method of safe administration of continuous intravenous inotropic support, to ensure the haemodynamic stability of the patient. The inotropes classified as Adrenaline, Noradrenaline Dopamine and Dobutamine have very short biological half lives (1-2 minutes) due to reuptake in tissues (Oh 1997). Adrenaline, Noradrenaline dopamine and dobutamine are double pumped at all times**.** (See notes in exclusion re dobutamine)
Dopexamine is also an inotrope but has a half life of 7 minutes (Opie & Girsh 2001, cited in Tim & Roe 2004) therefore does not require double pumping.

1.2 Due to the short half life of these drugs there must be an uninterrupted administration, thus one infusion is commenced when the other is almost empty, this is termed 'double pumping' or 'piggybacking' Any interruption in flow of the drug results in homodynamic instability and in extreme cases cardiac arrest (Trim & Roe 2004).

2. Purpose

2.1 To provide clear guidelines and standardise practice within the UCLH Critical Care Departments.

2.2 To ensure the safe administration of inotropic infusions.

3. Scope

3.1 All patients receiving continuous intravenous inotropic support specifically: Adrenaline, Noradrenaline Dopamine and Dobutamine.

Exclusions

- **This guideline may not be appropriate for all patients. Patients on a high dose of inotropes or with labile blood pressure may require a more patient specific approach. This group of patients must be taken into consideration as the method suggested in this guideline may not produce an observable rise in blood pressure and/or may precipitate arrhythmias.**
- **There is no literature defining a *high dose* of adrenaline and noradrenaline, therefore the critical care departments across the trust have suggested a dose of ≥0.4mcg/kg/min (30mcg/min) as a high dose.**
- **Dobutamine has vasodilatory properties as well as increasing heart rate and contractility (Adams & Osborne 05) As the dose increases these side effects can become more marked, dobutamine needs to be double pumped but, while the majority of patients *will not* have the effects mentioned, some do. This guideline *may not* be appropriate for double pumping dobutamine and a more patient centred approach may be required.**

3.3 Registered Nurse accredited to administer intravenous medication as stated in the UCLH foundation Trust medicine management: prescribing, administration and dispensing of medicines policy (February 2005)

3.3 Registered Nurse who has been assessed as competent by a senior member of the nursing team (F/G, education/practice development team) in critical care. Registered nurses with less than 6 months experience will require supervision and to be observed a minimum of three times from a competent critical care practitioner.

4. Definitions

4.1 Double pumping. - “Where one infusion is substituted for another without interrupting the flow of the drug to the patient”. (Trim & Roe 1994)

4.2 Inotrope - Several classes of agents are used to increase the force of myocardial contraction. Some of these agents stimulate more than one receptor. Those that stimulate alpha1 receptors causing vasoconstriction, while stimulation of Beta 1 receptors will increase heart rate and stimulation of beta2 will cause bronco dilatation and vasodilation. (Hudak 1999)

4.3 Syringe driver - Syringe driver “is a device designed to deliver a continuous and accurate infusion, particularly if small volumes of fluid need to be administered with great precision. (Technical service manual, Welmed. Issue 1.0)

5. Equipment Checklist

5.1 Two syringe drivers in good working order with mains power cables attached and switched on.

5.2 Two 50ml syringes with appropriate length intravenous extension line.

5.3 Labels for the syringe driver, syringe and extension line.

5.4 Three way tap attached to central line port.

5.5 A patent arterial monitoring cannula with compatible ECG and Blood Pressure waveform monitoring.

5.6 A working (appropriate size) non-invasive blood pressure cuff available.

6. Safety Issues

6.1 Ensure that the syringe driver batteries are fully charged and there is access to mains power.

6.2 Ensure that the syringe driver and extension line are labelled correctly to the pump and patient. It should be clear which driver is attached to which extension line.

6.3 Confirm that the dosage and drug are correctly stated on the syringe and on the syringe driver according to the prescription.

6.4 Ensure that three way tap is turned off to the standby pump when not in use.

6.5 Ensure pumps are at shoulder to knee height of the nurse.

6.6 If the concentration of the infusion is changed, the infusion line must be changed and labelled accordingly.

6.7 Do not alter levels of sedation during this procedure as this will mask changes in blood pressure

Labelling Example

Inotrope	Syringe Driver	Patient End
Drug 1 – Noradrenaline	**1** Noradrenaline 8mg/50ml	1. Noradrenaline 8mg/50ml Date
Drug 2 – Noradrenaline	**2** Noradrenaline 8mg/50ml	2. Noradrenaline 8mg/50ml Date
Drug 3 – Adrenaline	**1** Adrenaline 4mg/50ml	1. Adrenaline 4mg/50ml Date
Drug 4 – Adrenaline	**2** Adrenaline 4mg/50ml	2. Adrenaline 4mg/50ml Date

7. Expected Outcomes

7.1 Any change over of syringe will be achieved without altering the systolic blood pressure by more than 20mmHg.

7.2 The patient will maintain the desired blood pressure, indicated clinically.

8. Evidence base

8.1 Initially an audit was undertaken including the three critical care sites in the UCLH NHS foundation trust. A totally of 60 observational surveys was completed (20 in each unit), analyse of this audit can be viewed at……. The only existing guideline within this trust is the one based on an expert panel lead by Sheila Adam, this can be found by contacting the authors.

8.2 An extensive data base search revealed one audit. This was a survey undertaken within the general critical care department at St. Georges Healthcare NHS Trust. Given the minimal published research available these guidelines have been developed based on the audit undertaken with the UCLH NHS foundation trust and general consensus amongst the practice development team and consultants of each respective unit.

9. Emergency Action

9.1 If a patient becomes profoundly hypotensive or hypertensive seek advice from a senior clinician (medical/nursing) immediately. Inotropes should not be bolused.

Double pumping guideline

Commence doubling pumping (syringe change) when there is at least 30 minutes OR 5 mls of the infusion remaining (Whichever occurs first).
Turn three way tap so both syringes are 'on' to the patient. Start the new syringe at half the infusion rate, leaving the current syringe on current rate.
Monitor arterial blood pressure closely for a rise of up to, but no more than **20mmHg in systolic blood pressure**. This indicates the new syringe has reached an adequate pressure and is administering the drug to the patient. (If this is not observed within a **maximum** of 10 minutes, seek **advice** from a senior nursing clinician on duty).
Immediately increase new syringe to full rate, whilst decreasing the original syringe to half the original rate. Wean or turn old syringe off as indicated by systolic blood pressure.
Once the patient has recovered from the double pumping procedure, turn the three-way tap 'off' to the empty syringe, replace this syringe with a new syringe. This tap should remain 'off' to the secondary syringe when not in use.

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