Drug Guideline Title: Nimodipine

**Summary:** Nimodipine is used for the prevention and management of cerebral vasospasm associated with aneurysmal subarachnoid haemorrhage.

**Approved by:** ICU Director

**Publication (Issue) Date:** December 2014

**Next Review Date:** December 2017

**Replaces Existing Drug Guideline:** Nimodipine

**Previous Review Dates:** 2003, 2010, 2011

1. **Introduction:**

   The risk addressed by this policy:

   Patient Safety

   **The Aims / Expected Outcome of this policy:**

   Nimodipine will be administered safely via intravenous infusion and when clinically indicated weaned to oral administration. Oral nimodipine administration will be commenced in a timely manner and patients hemodynamic status closely monitored.

**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](#)
- [LH_ICU_Guideline_Care of patient with subarachnoid haemorrhage](#)

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
• Use only non-PVC tubing for administration.
• When administering oral nimodipine, ensure the drug is given at the specified times.
• Ensure that the patient is euveolemic to avoid hypotension post administration of the oral drug.

3. Principles / Guidelines

Actions\textsuperscript{1,2,3,16}
• Nimodipine is a calcium channel blocker and a cerebrally selective vasodilator. Its mode of action is thought to include:
  ➢ Relaxation of spastic arteries.
  ➢ Prevention of vasospasm.
  ➢ Opening-up of collateral vessels.
  ➢ Protective agent at the neuronal membrane level.
• It may have a preferential cerebral vasodilator action by prevention of calcium overload in neurons.
• It dilates the small resistance cerebral vessels and increases the cerebral blood flow, the increased perfusion being generally more pronounced in brain regions with preliminary damage and restricted circulation than in healthy regions.
• Nimodipine binds to specific receptor sites in the central nervous system. It inhibits calcium ion transfer into these cells and inhibits contractions of vascular smooth muscle.

Indications\textsuperscript{1,2,3}
• Prevention and treatment of delayed ischaemic neurological deficit, secondary to aneurysmal subarachnoid haemorrhage (SAH).
• Prevention and treatment of cerebral vasospasm associated with aneurysmal SAH.

Contraindications
• Hypersensitivity.

Precautions\textsuperscript{1,2,3}
• Nimodipine can cause hypotension. If hypertensive therapy is being pursued or the patient develops significant hypotension during nimodipine treatment, the dose should be reduced or nimodipine should be withheld.
The metabolism of nimodipine is decreased in patients with impaired hepatic function. Such patients should have their blood pressure and pulse rate monitored closely and should be given a lower dose (usually 50% of normal dose).

**Significant Interactions**\(^1,^2,^3\)
- IV beta-blockers (can cause negative inotropic effects).
- Rifampicin (reduces effectiveness of nimodipine).
- Grapefruit juice (in oral nimodipine administration) reduces effectiveness of nimodipine.
- Phenytoin oral dose decreases nimodipine oral bioavailability by 7-fold.
- Sodium valproate oral dose increases the bioavailability of oral nimodipine dose by 50%.

**Adverse Effects**\(^1,^2,^3\)
- Hypotension, especially in patients with a history of hypertension (10-20mmHg drop occurs).
- Increased liver enzymes, urea, and creatinine.
- Pseudo-obstruction of the bowel (Ogilvie’s Syndrome).
- Flushing, headache.

**Presentation**
- Intravenous: 10 mg nimodipine in 50 mL vial
- Oral: 30 mg tablet, yellow, scored

**Administration Guidelines**\(^1,^2,^3,^13,^16\)

**IV infusion**
- Draw up contents of vial in a 50ml syringe and prime non-PVC extension tubing (for administration via a syringe driver).
- Do not dilute.
- Should be administered via a dedicated lumen of a CVAD with a co-infusion. (May be infused via a peripheral line whilst waiting placement of a triple or quad-lumen central line).
- Intravenous infusions must have a 3-way tap attached with concomitant infusion of diluent. Infuse a compatible fluid at a rate of 4 times the nimodipine infusion rate (1:4):

<table>
<thead>
<tr>
<th>Dose</th>
<th>0.5 mg/hour</th>
<th>1 mg/hour</th>
<th>2 mg/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimodipine infusion rate</td>
<td>2.5 mL/hour</td>
<td>5 mL/hour</td>
<td>10 mL/hour</td>
</tr>
<tr>
<td>Fluid co-infusion rate</td>
<td>10 mL/hour</td>
<td>20 mL/hour</td>
<td>40 mL/hour</td>
</tr>
</tbody>
</table>

**Compatible fluids**: Albumin 4%, dextran 40, 5% glucose, Hartmann’s, mannitol 10%, 0.9% sodium chloride.

- Infusions are to be protected from direct sunlight; it is viable for 10 hours in overhead electric light.

**Infusion rate:**
- Commence at 15 micrograms/kg/hr (5mL/hr) for the first 1-2 hours, if BP stable; proceed to recommended dose.
- May need to commence slowly (2.5mL/hr) if patient has decreased BP.
- Recommended dose: **30 micrograms/kg/hr**; @ 10mL/hour for 70kg patient.
- Correct fluid imbalance, commence CVP monitoring for trend, volume load as clinically indicated.
- Maintain MAP and CPP according to pre and post-operative needs; see Care of patient with SAH guideline.
• After 7-10 days IV therapy; no incidence of delayed cerebral ischaemia and the patient is clinically stable, oral nimodipine may commence.
• All infusion tubing must be changed every 24 hours.

Weaning from IV therapy to oral therapy: Weaning commences when the first dose of oral therapy is administered.
• Administer 1st oral dose of 60mg nimodipine – must be prescribed \textit{and} administered at fourth hourly intervals.
• Infusion Weaning: 1 mL every hour for 5 hours, then cease infusion.
• Observe for neurological deterioration (decrease in the GCS or development of focal deficit: report immediately or as per MET calling criteria).
• If the patient does deteriorate neurologically, cease weaning IV nimodipine and return to full IV therapy. Obtain medical review and document plan of care.
• Duration of oral therapy is a minimum of 7 days up to 14 days (may be extended in the presence of prolonged vasospasm).
• There are no variations on the dosage unless there are significant weight variances.

Note:
• BP may fall during administration of oral nimodipine, particularly at peak levels (20 mins post ingestion).
• Urgently notify Intensive Care Registrar if BP less than the prescribed parameters.
Monitor CVP and BP; ensure adequate fluid intake 2-3 litres/day (whether IV or oral).

Clinical Considerations - Observations during IV therapy
• Monitor vital signs – heart rate and blood pressure continuously during IV administration.
• Closely monitor GCS and monitor for signs of focal deficit.
• Document hourly GCS, BP, Temp, HR, RR, SpO2, ICP, CPP.
• Vasospasm may be seen angiographically without evidence of clinical vasospasm. Transcranial Doppler (tcD) sonography may be used to measure vasospasm.
• Monitor and document hourly fluid balance, daily urinalysis.
• Invasive arterial monitoring should be in place with close observation of set parameters.
• Daily ECG and prn - if on inotropes / vasopressors.

Observations during oral therapy:
• Second hourly GCS, BP, Temp, HR, RR, SpO2, and BP, required BP parameters to be prescribed in clinical notes.
• Once stable on ward, observations may progress to 4th hourly.
• Strict fluid balance, with intake to total 2-3 litres/day.
• Daily urinalysis.
• Immediately report if blood pressure alters beyond prescribed parameters for the individual patient.
• Observe for neurological deficits – signs of facial droop, arm or leg weakness; notify Neurosurgeon urgently.
• Observe for decrease in the level of consciousness; observe MET calling criteria.
• If patient becomes drowsy and unable to swallow, review MET criteria and call as appropriate, notify Intensive Care Registrar.
4. Performance Measures

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

5. References / Links


Author: RN ICU (Y. McManus), CNC – ICU (S. Shunker);
Reviewers: ICU – CNC, CNE, NM, NUM, Staff Specialists, CNS 's, Medical Director, Pharmacist
Endorsed by: A/ Prof M. Parr, Director ICU.