Drug Guideline  Neostigmine

Approved by:  ICU Medical Director
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Replaces Existing Drug Guideline:  Neostigmine 2004

Background Information:
Neostigmine is an anticholinesterase agent which inhibits reversibly the hydrolysis of acetylcholine by competing with acetylcholine for attachment to acetylcholinesterase. As a result, acetylcholine accumulates at cholinergic synapses and its effects are prolonged and exaggerated.

1. Introduction:

Patient safety

The Aims / Expected Outcome of this drug guideline:

Patients who have received non-depolarising muscle relaxants will be successfully reversed after neostigmine administration. Neostigmine will assist in the management of Myasthenia Gravis symptoms in ICU patients.

Related Standards or Legislation

NSQHS Standard 1 Governance
National Standard 4 Medication Safety

Related Policies

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2. Drug Guideline: 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.
• Parental 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

3. Guideline

Actions

• Neostigmine is an anticholinesterase.
• It inhibits the effects of acetylcholinesterase, thereby potentiating the effects of acetylcholine (Ach). It is therefore capable of producing a generalised cholinergic response.
• Neostigmines produces miosis, increased intestinal and skeletal muscle tone, bronchoconstriction, bradycardia and stimulation of salivary and sweat glands.
• In addition, neostigmine is used mainly for its direct cholinomimetic effect on skeletal muscle and to a lesser extent to increase the activity of smooth muscle.
• Its half life is 47-60 minutes after intravenous injection.

Indications

• Reversal of non-depolarising muscle relaxants (e.g. vecuronium). This should only be performed once some paralysis has worn off as determined by twitch response on a nerve stimulator or movement. Used in conjunction with Atropine or Glycopyrrolate to minimise risk of cholinergic crisis.
• For Myasthenia Gravis management in ICU, during acute exacerbations and when the condition is severe.
• Acute management of Glaucoma
• Prophylaxis and treatment of postoperative intestinal atony and urinary retention.

Contraindications

• Mechanical obstruction of the intestinal or urinary tracts.
• Peritonitis.
• Known hypersensitivity to neostigmine.

Precautions

• Use with caution in patients with bronchial asthma, cardiac disease, epilepsy, hypotension, Parkinsonism, peptic ulceration, Addison’s disease, hyperthyroidism and recent intestinal or bladder surgery.
• IV Atropine should be readily available to reverse overt acetylcholine effects.

Significant interactions

• Corticosteroids may decrease the acetylcholinesterase effects of neostigmine.
Neostigmine may prolong the depolarising neuromuscular blocking action of depolarising muscle relaxants such as suxamethonium and prolonged apnoea may result.

Atropine reverses the muscarinic effects of neostigmine. This interaction is used to counteract the muscarinic symptoms of neostigmine toxicity, however masking the signs of overdosage can lead to inadvertent induction of cholinergic crisis with the use of atropine.

**Adverse effects**

- **Muscarinic effects:**
  - Bradycardia, arrhythmias, hypotension.
  - Increased salivation, bronchial secretions
  - Bronchospasm, respiratory depression
  - Nausea, vomiting, abdominal cramps, diarrhoea.

- **Nicotinic effects:**
  - Fasciculation’s
  - Muscle weakness

**Presentation**

Neostigmine 2.5mg in 1ml ampoule.

**Administrations Guidelines**

To reverse neuromuscular block secondary to non-depolarising neuromuscular blocking agents:

Prepare separate syringes of neostigmine and atropine to administer in the following doses:

- Simultaneously administer 0.5–2.5mg neostigmine with 0.6–1.2mg atropine as a slow IV bolus over 1 minute. This is generally adequate for complete reversal of nondepolarising muscle relaxants within five to 15 minutes
- Maximum dose of neostigmine is 5mg.

**Myasthenia Gravis:**

- Neostigmine 1mg to 2.5 mg given intramuscularly or subcutaneously at intervals throughout the day when greater strength may be needed (e.g. mornings and before meals), giving a total daily dose of 5 to 20 mg. Duration of action of a single dose is two to four hours.

**Intestinal Atony.**

**Prevention:**

- Administer Neostigmine 0.25 mg intramuscularly or subcutaneously before or immediately after the operation. Repeat every 4 to 6 hours for 2 to 3 days.

**Treatment:**

- Administer Neostigmine 0.5 mg intramuscularly or subcutaneously. Repeat at intervals of four to six hours.

**Urinary retention.**

**Prevention:**

- Administer Neostigmine 0.25 mg intramuscularly or subcutaneously immediately after the operation. Repeat every 4 to 6 hours for 2 to 3 days

**Treatment:**

- Administer Neostigmine 0.5 mg intramuscularly or subcutaneously, and apply heat to the lower abdomen.
- After the patient has voided, continue 0.5 mg subcutaneously or intramuscularly every 3 hours for at least 5 doses.
If there has been no urinary response within one hour of the first dose, the patient should be catheterised.

**Acute colonic pseudo-obstruction (Ogilvie syndrome)**
- Administer Neostigmine 2mg intravenously over 3 to 5 minutes.
- **Note:** Administration over 60 minutes may reduce the incidence of bradycardia; however, efficacy may be reduced. Ensure atropine is available at the bedside to treat symptomatic neostigmine-induced bradycardia

**Clinical Considerations**
- When neostigmine is being used to reverse neuromuscular blockade, it is recommended that the patient be well ventilated and a patent airway maintained until complete recovery of normal respiration is affirmed.
- The two drugs Neostigmine and Atropine are often given simultaneously in separate syringes, but in patients with bradycardia the pulse rate should be increased to about 80 beats/minute with atropine before administering neostigmine.
- The speed of recovery from neuromuscular blockade is primarily determined by the intensity of the block at the time of antagonism. It is also influenced by other factors including the presence of drugs (e.g. anaesthetic drugs, antibiotics and antiarrhythmic drugs) and physiological changes (e.g. electrolyte and acid-base imbalance, renal impairment).
- Monitor respiratory status and vital signs closely.

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**

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