Drug Guideline  Aminophylline

Summary: Aminophylline dissociates into theophylline, which is a xanthine derivative. Its main action is bronchial smooth muscle relaxation, thereby relieving broncospasm.

Approved by: ICU Medical Director

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Next Review Date: July 2016

Replaces Existing Drug Guideline: January 2009


1. Introduction:

Patient safety

The Aims / Expected Outcome of this drug guideline:

Aminophylline will be administered safely and appropriately without any adverse side effects

Related Policies

• C3.00 Drug prescribing
• C3.01 Drug administration
• C3.01 Administration of IV Medications

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.
• 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.

3. Guideline

**Actions**

Aminophylline is derived from theophylline. It is a xanthine derivative, phosphodiesterase inhibitor and a bronchodilator.

- Its main action is direct relaxation of bronchial smooth muscle, relieving bronchospasm.
- The bronchodilation may also occur by inhibition of selected phosphodiesterases, which produces an increase in intracellular cyclic AMP.
- It directly stimulates the medullary respiratory centre, stimulates the central nervous system, and decreases cerebral vasoconstriction.
- Stimulates cardiac muscle (increasing heart rate and myocardial contractility at high doses).
- Acts on the renal tubules of the kidney to produce transient diuresis.
- Increases gastric secretion and decreases peripheral resistance.

**Indications**

- Treatment of bronchospasm associated with chronic bronchitis, emphysema, bronchial asthma and obstructive pulmonary disease.

**Contraindications**

- Hypersensitivity to xanthine compounds (such as caffeine), theophylline and ethylenediamine.
- Coronary artery disease where myocardial stimulation may prove harmful.
- Bronchiolitis (bronchopneumonia).

**Precautions**

- Use cautiously in patients undergoing therapy with other xanthines, such as theophylline as there is a hazard of serious toxicity.
- Patients with compromised cardiac or circulatory function including congestive heart failure, angina pectoris or acute myocardial injury as myocardial stimulation could be harmful.
- Use cautiously in elderly patients and those with chronic obstructive pulmonary disease, cor pulmonale, acute pulmonary oedema or pneumonia, renal or hepatic dysfunction, since clearance may be decreased and hence toxicity more likely.
- Use with caution in patients with hyperthyroidism, diabetes mellitus, glaucoma, peptic ulcer, severe hypoxaemia and hypertension, tachydysrhythmia and gastro-oesophageal reflux, as these conditions may be exacerbated.
- Aminophylline lowers seizure threshold and must be used with caution in patients with seizure disorder (unless they are receiving appropriate anticonvulsant therapy).
- Do not administer intravenous aminophylline too rapidly as it can cause anxiety, headache, nausea, vomiting, severe hypotension, dizziness, palpitations, syncope, flushing, profound bradycardia, premature ventricular contractions and cardiac arrest.

**Significant interactions**

- Concurrent use of aminophylline and beta-blockers may result in an inhibition of the bronchodilatory effects of aminophylline.
• Concurrent use of aminophylline and benzodiazepines may result in a reduction or reversal of the sedative effects of benzodiazepines.
• Aminophylline may enhance the sensitivity of the myocardium to, and the toxic potential of, cardiac glycosides.
• Concurrent use of aminophylline and ketamine may result in a lowered seizure threshold.
• Aminophylline may antagonise the effects of neuromuscular blocking agents.

Adverse effects\textsuperscript{1,3}
• Tachycardia, palpitations, extrasystoles, increased pulse rate, peripheral vasoconstriction and flushing.
• Headache, visual disorders, insomnia, anxiety, confusion, restlessness, vertigo, tremor, nervousness, irritability, dizziness, reflex hyperexcitability, seizures.
• Nausea, vomiting, heartburn, epigastric pain, cramping, anorexia, diarrhoea, haematemesis.
• Increased urination, albuminuria.
• Tachypnoea.

Presentation
250 mg in 10 mL ampoule (25 mg/mL)

Administrations Guidelines
**Note:** Dose is calculated on lean (ideal) body weight.
Administer by slow intravenous infusion at a rate not exceeding 25mg/min.

**Loading dose for adults:**
• For patients not currently undergoing aminophylline or theophylline therapy, administer a dose of **6 mg/kg over 20-30 minutes (no more than 25 mg/min)**, to provide a peak serum theophylline concentration of approximately 10 microgram/mL (55 micromol / L).
• For all patients currently undergoing aminophylline or theophylline therapy a serum theophylline level should be obtained. The dose in these patients is calculated based on the principle that a dose of 0.6mg/kg will increase the serum theophylline concentration by 1 microgram/ml.
• Dilute loading dose with 0.9% sodium chloride or 5% glucose to total 100mL volume and administer over 30minutes.
(For average 70kg person, 6mg /kg dose = 420mg).

**Maintenance dose:**
Dilute 500mg (2 x 10ml ampoules) in 100ml of 0.9% sodium chloride. This will give a concentration of 5mg /mL. Administer infusion via volumetric pump at desired rate

The table below outlines the maintenance dose for aminophylline.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Maintenance dose in mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For next 12 hours post</td>
</tr>
<tr>
<td></td>
<td>loading dose</td>
</tr>
<tr>
<td>Young adult smokers</td>
<td>1.0 mg/kg</td>
</tr>
<tr>
<td>Non-smoking adults</td>
<td>0.7 mg/kg</td>
</tr>
<tr>
<td>Older patients or those with cor pulmonale</td>
<td>0.6 mg/kg</td>
</tr>
<tr>
<td>Patients with congestive heart failure or hepatic failure</td>
<td>0.5 mg/kg</td>
</tr>
</tbody>
</table>
Clinical Considerations

- All patients on aminophylline infusions should have daily theophylline levels measured. The dose of aminophylline is administered on the principle that aminophylline 0.6mg/kg lean body weight will increase the serum theophylline concentration by 1 microgram/mL.
- Serum concentrations of around 5 – 20 microgram/mL (27.5-110 micromol/L) are generally considered therapeutic.
- Levels above 20 microgram/ml (110 micromol/L) produce toxic effects.
- The mixing of alkaline labile substances should be avoided.

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
1. MIMS Online, CIAP: NSW Health Department, Copyright MIMS Australia Pty Ltd. February 2012. http://www.use.hcn.com.au

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