Severe Acute Asthma: IV Aminophylline

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Introduction and indication for use

Intravenous (IV) aminophylline provides relief from severe bronchospasm associated with asthma and forms part of the treatment of severe acute asthma.

IV Aminophylline should only be prescribed in:

- Severe acute asthma, which is unresponsive to nebulized bronchodilators
- Life threatening asthma

See the RACH Wheeze/asthma treatment pathway on BSUH microguide (Paediatrics & Neonatology > Paediatrics > A-Z > A) for further information.

IV Aminophylline must be prescribed and monitored carefully as a continuous infusion, which may or may not require a loading dose (see below).

IV Aminophylline may only be administered in CED Resus (at initiation) or HDU

Cautions

Dosing considerations:

- Obtain accurate weight for dosing. If an estimated weight is used, an accurate weight MUST be obtained at the earliest opportunity to avoid toxicity
- For obese children calculate the dose using TBW (total body weight) for loading dose and IBW (ideal body weight) for maintenance
- Children <1 year – metabolic pathway is immature, monitor these patients closely for signs of toxicity
- Many drugs interact with Aminophylline and can effect plasma concentrations. These include some antibiotics and anti-epileptics. Check for drug interactions with a Pharmacist or in the BNFc

Caution in:

- History of seizure activity – risk of seizures even if levels within therapeutic range. Consider alternative treatment. Monitor for signs of central stimulation if used.
- Active influenza
- Acute febrile illness

Plasma concentration may be increased in heart failure, hepatic impairment or chronic alcohol use and renal impairment

Plasma concentration may be decreased in smokers (including cannabis)

Conditions that may be exacerbated by Aminophylline:

- Peptic Ulcer
- Hyperthyroidism
- Glaucoma
- Diabetes mellitus
- Severe hypoxaemia
- Hypertension
- Compromised cardiac or circulatory function
Dose and Administration

Loading Dose: 5mg/kg (max 500mg) over 20 minutes. **DO NOT GIVE loading dose if the patient takes oral theophylline or aminophylline**

Maintenance Infusion:
- 1 month – 11 years: 1mg/kg/hour
- 12 – 17 years: 0.5mg/kg/hour

Round calculated dose to the nearest whole number

Obese Dosing:
Calculate the dose using
- TBW for loading dose
- IBW for maintenance

(For further information See SPS article "How should medicines be dosed in children who are obese?" reference 11)

**Example of prescribing for 18 kg five year old**

### Loading Dose:

**PRE-OPERATIVE & ONCE ONLY PRESCRIPTIONS. IV fluids must be prescribed on the Intravenous infusion Prescription Sheet (page 12)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Drug Approved Name (BLOCK LETTERS)</th>
<th>Dose</th>
<th>Route</th>
<th>Time to be given</th>
<th>Prescriber name and signature</th>
<th>Bleep</th>
<th>Given by</th>
<th>Date &amp; Time given</th>
<th>For Pharmacy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>14/02/20</td>
<td>Ametop/EMLA</td>
<td></td>
<td>TOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14/02/20</td>
<td>Aminophylline</td>
<td>90mg</td>
<td>IV</td>
<td>14:10</td>
<td>A. Doctor</td>
<td>8669</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Maintenance Infusion:

**INTRAVENOUS INFUSION PRESCRIPTION SHEET (NOT FOR BLOOD PRODUCTS)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Infusion Fluid</th>
<th>Volume</th>
<th>Drug/Additives</th>
<th>Dose</th>
<th>Rate (mL/hour)</th>
<th>Dr. Sign &amp; Bleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>14/02/20</td>
<td>14:30</td>
<td>Sodium chloride 0.9% w/v</td>
<td>500mL</td>
<td>Aminophylline</td>
<td>500mg</td>
<td>18 mL/hr</td>
<td>A. Doctor 8669</td>
</tr>
</tbody>
</table>

Administration (using aminophylline 25 mg/ml):

*See Medusa IV Monograph for full administration information*

- Remove 20 mL from a 500 mL bag of 0.9% sodium chloride
- Add 500mg Aminophylline to 480 mL Sodium Chloride 0.9% to get an aminophylline concentration of 1 mg/ml
- Prime the IV line with the prepared aminophylline infusion to avoid any delay in the child receiving the medication
- Administer via an infusion pump
- If giving a loading dose, administer using the prepared infusion over 20 minutes
- For the maintenance infusion, a concentration of 1mg/mL means the mg/kg/hour = mL/kg/hour (e.g. 20mg/kg/hour dose = 20mL/kg/hour rate)
- Always set the volume to be infused on the pump to prevent overdose
- **DO NOT** administer aminophylline using the same IV access as Salbutamol infusion (incompatible)
Monitoring

- Monitor for clinical effect
- Continuous cardiac monitoring (ECG & heart rate)
- Observations (Respiratory Rate, Blood Pressure & Oxygen Saturation):
  - Every 5 minutes for the first 10 minutes, then
  - Every 15 minutes until patient stable and at least 1 hour since starting
  - Hourly thereafter
- U&Es every 12 hours (minimum) to monitor effect on potassium level

PLASMA LEVELS

Check the Plasma theophylline level every 6 hours until the level is stable, then every 24 hours (aminophylline is converted to theophylline in vivo)

The therapeutic range is 10-20mg/L
A lower concentration (5 - 15 mg/L) may be effective in some individuals. Adverse effects can occur within the 10 - 20 mg/L range, increasing in frequency and severity above 20 mg/L

Dose adjustment advice:
- <5mg/L: Increase dose by 50% and re-check in 6 hours
- 5-15mg/L: Continue and re-check in 24 hours
- 15-20mg/L: Reduce dose by 50% and re-check in 24 hours
- >20mg/L: STOP infusion and re-check in 6 hours

Round re-calculated doses to the nearest whole number

Side effects & signs of toxicity

- Muscle tremors (especially in hands)
- Tachycardia
- Nausea & vomiting
- Headaches
- Agitation & hyperactivity
- Palpitations
- Feelings of warmth

Discontinuing IV Aminophylline infusion

Criteria to step-down from IV bronchodilator therapy:
- Normal respiratory effort
- Normal ability to speak
- Reduction on oxygen requirement

Reduce the dose of IV aminophylline by 50% every 6 hours. Following cessation of the infusion, aminophylline will be cleared within 72 hours (elimination half-life 3-5 hours)

Patients should remain on regular inhaled or nebulised bronchodilators whilst weaning off IV therapy. Rebound bronchospasm can occur 24-48 hours after stopping IV aminophylline – the patient will need to remain in hospital for observation during this period.
References


2. BNF for children, August 2020


5. Yung M and South M Randomised control trial of aminophylline for acute severe asthma. Arch Dis Child 1998;79:405-410


8. NHS North West & North Wales Paediatric transport Service. Management of acute severe asthma in >1 year. 05/09/2018

