Guideline for the delivery of nebulised medication

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Key Amendments

Date	Amendment	Approved by
February 2018	Hypertonic Saline Section amendments. Delivery section amended	Paediatric QI
19th Nov 2020	Document extended for 1 year	Dr J West/Paediatric QIM
26th March 2021	Document reviewed and approved for 3 years with no changes	Clare Onyon/ Paediatric Guideline Review Meeting
9th Feb 2024	Saline section added	Paediatric Guideline Review

Introduction
Nebulisation is often perceived as being a more efficient method of administering inhaled medication than inhalers. However, the evidence is that, where the correct inhaler is used, patients get the same benefit via inhaler as they would via a nebuliser, (Boe et al, 2001). Indeed children are less likely to have tachycardia when give beta$_2$agonists via inhaler and spacer than when the drug is given by a nebuliser, (BTS/SIGN, 2008). Nebulisers should not therefore be considered to be the first option for asthma management, unless the patient has severe or life threatening symptoms, when nebulisers should be used (BTS/SIGN, 2008; Mason et al, 2008).

CHILDREN WITH MILD AND MODERATE EXCERBATIONS OF ASTHMA SHOULD BE TREATED BY MDI AND SPACER DEVICE as per the Guideline for the management of acute asthma in children (WAT_PAE-047).

Nebulisation is not risk free. There is a risk of introducing infection if the equipment is not maintained correctly. There are also medication side effect risks, e.g. high dose bronchodilators may cause tachycardia (NICE, 2010), that need to be taken into consideration. It is therefore important that the correct nebuliser device is selected and that it is cleaned and maintained properly.

Nebulisation is not “easier” than using inhalers. Inhalers take no more nursing time than using nebulisers (Mason et al, 2008) and, from the patient point of view, cleaning and setting up a nebuliser is more complex than caring for an inhaler (NICE, 2010).

Nebuliser equipment:
There are different types of nebuliser equipment, which must be selected according to the needs of the patient and the inhaled medication being used.

- Standard nebuliser and mask driven by oxygen is appropriate for people having beta$_2$agonists or saline (RCN 2009).

- Standard nebuliser with mouthpiece should be used where ipratropium bromide is being administered. In younger children unable to use a mouthpiece a close fitting mask must be secured around their nose.
- Standard nebuliser with mouthpiece and filter should be used where antibiotics are being administered. If a child has their own nebuliser at home for the administration of inhaled antibiotics this should be encouraged to be used in the hospital setting.

For in-patients, the nebuliser equipment must be labelled with the patient's details to ensure that it is maintained for single patient use only.

Medication:
Nebulised medication should be diluted with 0.9% Sodium Chloride to a minimum volume of 4mls and a maximum volume of 10mls.

Salbutamol:
Is the first line treatment for acute asthma. However, continuous salbutamol is of no greater benefit than the use of frequent intermittent doses in the same hourly dosage. Metered dose inhaler (pMDI) + spacer are the preferred option in mild to moderate asthma. Nebulised salbutamol should only be given if oxygen saturations are below 92% or if it is a severe or life threatening attack.

Ipratropium Bromide:
This has the potential to cause glaucoma when it comes into contact with the eyes, especially when it is used in conjunction with beta$_2$agonists. Wherever possible, a mouthpiece should be used when administering this medication. If a mouthpiece cannot be used, then the person administering the medication must ensure that the mask is tight fitting and that the medication is not blowing into the patient's eyes.

Salbutamol and ipratropium bromide nebules may be mixed immediately before use and administered as one nebulisation.

Do not mix other combinations before checking with pharmacy.

0.9% Sodium Chloride:
Where a patient has difficulty clearing sputum, nebulising 0.9% Sodium Chloride may help to increase sputum yield, reduce sputum viscosity and improve ease of expectoration, (Pasteur et al, 2010).

Hypertonic Saline (3%):
Hypertonic saline (3%) works by drawing water into the airways and into sputum (CF Trust 2016) and may be used to aid expectoration where patients are experiencing difficulties. Administration of the drug should be in the presence of a doctor or senior nurse. A physiotherapist should be available by bleep if the secretions continue to be difficult to clear.

Nursing staff should remain with the patient throughout the administration of the hypertonic saline for the first dose given due to the risk of bronchospasm. Where a patient is known to have a problem with bronchial hypersensitivity, a bronchodilator should be administered prior to hypertonic saline, (Pasteur et al, 2010).

Hypertonic Saline (6%-7%):
Cystic Fibrosis patients are commonly prescribed hypertonic saline for long-term use and may continue to use it during inpatient stays. It may also be considered in other patient groups e.g. Bronchiectasis, chronic lung disease with sputum retention. Any new prescription of 6% or 7% hypertonic saline should be discussed with a senior doctor or specialist respiratory physiotherapist and monitored for the initial dose in case of bronchospasm.

Adrenaline (1 in 1000 solution):
Adrenaline - 400 micrograms / kg (0.4mls /kg of 1 in 1000 solution) maximum 5mg (5mls of 1 in 1000 solution) can be given for severe croup. Adrenaline provides symptomatic relief of croup but has a short duration of action and can be repeated as necessary. However, observations for a "rebounding effect" must be made where symptoms can worsen as the effects of the medication wear off after 60 – 90 minutes.

Steroids:
Budesonide via nebuliser can be administered for croup / stridor (Boe et al, 2001). Where steroids are given by nebuliser there is a risk of topical side effects to the skin and mouth. Nebulised budesonide should only be given for croup if the child is unable to tolerate oral medication (i.e the vomiting child).

Antibiotics:
These may be used where a patient has chronic bacterial colonisation. There is a risk of inducing bronchospasm when using nebulised antibiotics. Nebulised antibiotics pose a potential occupational health risk to staff, as exposure to aerosolised antibiotics can be a cause of occupational asthma. Ward patients using nebulised antibiotics should use a standard nebuliser with mouthpiece and with either filter or exhaust system. If a child has their own nebuliser at home for the administration of inhaled antibiotics this should be encouraged to be used in the hospital setting.

Dornase alfa (DNase):
This drug is a mucolytic agent that reduces sputum viscosity. It is generally used with children with cystic fibrosis who have moderately severe lung disease, require frequent intravenous antibiotics and are productive of sputum. For more information please refer to the Guidelines/Standards for the management of children and young people with cystic fibrosis.

Driving gas:
Where a patient is being treated for acute severe asthma, oxygen should be used as the nebuliser driving gas, (BTS/SIGN, 2008)
The usual flow rate for the driving gas is 6 – 8 L/min. If lower flow rates are used, the aerosol particle size generated may be too large to penetrate the lung fields properly. This rate will deliver at least 60% of the droplets at a size below 5 microns (which is required for
adequate penetration into distal airways).

In accordance with the trust's medicines policy, the driving gas should be stated on the patient's medication chart.

Delivery:
Medication must be given in accordance with the Trust's medicines policy.
Ensure the patient is positioned so that the nebuliser can function effectively and so that the mask or mouthpiece is correctly positioned. Generally, being sat upright is best.
Patients should be advised to relax and breathe normally; the treatment should not be hard work.
Advise the patient to tap the chamber during nebulisation to shake down large droplets and ensure maximum delivery of the drug.
Most nebulised medications are complete within 5 – 10 minutes. When completed, the nebuliser makes a "spluttering" sound. Since it is often difficult for patients to nebulise a dose to dryness; they should be advised to nebulise for approximately one minute after spluttering of the nebuliser occurs to ensure full dosage is given. Unused solution should be discarded at the end of each dose.

Hygiene:
Nebuliser equipment can become contaminated by bacteria, (Barnes et al, 1987; Hutchinson et al, 1996; Oie et al 2006) The risk of bacterial contamination is low where nebulisers are disposed of on a daily basis

(O'Malley et al, 2007) or cleaned on a daily basis, (Oie et al, 2006). Unless stated otherwise on the product packaging all nebuliser equipment must be cleaned or disposed of on a daily basis. Standard cleaning should involve washing the nebuliser component with detergent and water, rinsing and left to air dry in a clean environment.

Home nebulisers:

The key method for administration of inhaled medication for both adults and children is via inhaler, (BTS/SIGN, 2008; Mason et al, 2008; Clarke et al, 2010).

Where the medication required is not available in an inhaler, e.g. antibiotics, home nebuliser will be required. (Boe et al, 2001). Nebulisers for home use should only be used following full assessment of the individual (Boe et al, 2001; NICE, 2010), usually in the out-patient setting by the Respiratory paediatrician, Respiratory Specialist Nurses or Respiratory Physiotherapist.

Long term nebulised antibiotics are used for people with Cystic Fibrosis and non-CF bronchiectasis with chronic bacterial colonisation. The aim of treatment is to improve symptoms and decrease exacerbation rate (Pasteur et al, 2010).

For nebulised antibiotics, the assessment should include:

- Explanation of the principles, benefits and risks of treatment
- Identification of the antibiotic to be used, based on the results of sputum microbiology, culture and sensitivity
- Review of sputum management techniques, including frequency and type of chest physiotherapy.
- Demonstration of how to use and maintain the equipment.
- Arrangements for review of exacerbation frequency.

The paediatric respiratory team has a number of PARI Turboboy home nebulisers provided to children for nebulised antibiotics, DNase or hypertonic saline use. An e-flow nebuliser may be considered if children are using multiple treatments to reduce the burden of care. A trial of nebulised treatment will be carried out in Children's Clinic, led by the Respiratory Physiotherapist or Nurse Specialist to monitor for any side effects.

The use of home nebulisers for asthmatic patients is not advocated. As nebulisers should not be considered as the first option for asthma management, unless the patient has severe or life threatening symptoms, (BTS/SIGN, 2008; Mason et al, 2008) home nebuliers are unwarranted. Self-treatment of asthma attacks at home with a nebuliser can be dangerous as the individual will need to be properly assessed by a doctor or a nurse to determine whether additional treatment (oxygen, prednisolone) is required. (Asthma UK).

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