

Chapter 3

Respiratory system

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Respiratory system, drug delivery

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Inhalation

This route delivers the drug directly to the airways; the dose required is smaller than when given by mouth and side-effects are reduced.

Children and their carers should be advised to follow manufacturers' instructions on the care and cleansing of inhaler devices.

Inhaler devices

EvGr In young children, a pressurised metered-dose inhaler should be used with a spacer; use of a facemask is required until the child can breathe reproducibly without it. A nebuliser may be required when these methods are ineffective.

In children over the age of 5 years with chronic asthma, a *pressurised metered-dose inhaler* used with a spacer (with or without a spacer for children over 12 years) is as effective as any other hand-held inhaler. A spacer should always be used if the patient is on a high dose of inhaled corticosteroid.

In children over the age of 5 years with mild and moderate acute asthma attacks, a pressurised metered-dose inhaler with a spacer is at least as effective as nebulisation. **⚠**

By the age of 3 years, a child can usually be taught to use a spacer device without a mask. As soon as a child is able to use the mouthpiece, then this is the preferred delivery system. When a pressurised metered-dose inhaler with a spacer is unsuitable or inconvenient, a *dry-powder inhaler* or *breath-actuated inhaler* may be used instead if the child is able to use the device effectively.

Dry powder inhalers may be useful in children over 5 years, who are unwilling or unable to use a pressurised metered-dose inhaler with a spacer device; *breath-actuated inhalers* may be useful in older children if they are able to use the device effectively. The child or child's carer should be instructed carefully on the use of the inhaler. It is important to check that the inhaler is being used correctly; poor inhalation technique may be mistaken for a lack of response to the drug.

On changing from a pressurised metered-dose inhaler to a dry powder inhaler, the child may notice a lack of sensation in the mouth and throat previously associated with each actuation; coughing may occur more frequently following use of a dry-powder inhaler.

CFC-free metered-dose inhalers should be cleaned **weekly** according to the manufacturer's instructions.

EvGr Children, and their parents or carers should be instructed carefully on the use of the inhaler. It is important to check that the inhaler continues to be used correctly because inadequate inhalation technique may be mistaken for a lack of response to the drug. The number and different

types of inhalers given to a child should be minimised. To help reduce confusion and ensure children receive inhalers they have been given training for, specify brand and inhaler when prescribing. **⚠**

MHRA/CHM advice: Pressurised metered dose inhalers (pMDI): risk of airway obstruction from aspiration of loose objects (July 2018)

The MHRA have received reports of patients who have inhaled objects into the back of the throat—in some cases objects were aspirated, causing airway obstruction. Patients should be reminded to remove the mouthpiece cover fully, shake the device and check that both the outside and inside of the mouthpiece are clear and undamaged before inhaling a dose, and to store the inhaler with the mouthpiece cover on.

Spacer devices

Spacer devices are particularly useful for infants, for children with poor inhalation technique, or for nocturnal asthma, because the device reduces the need for coordination between actuation of a pressurised metered-dose inhaler and inhalation. The spacer device reduces the velocity of the aerosol and subsequent impaction on the oropharynx and allows more time for evaporation of the propellant so that a larger proportion of the particles can be inhaled and deposited in the lungs. Smaller-volume spacers may be more manageable for pre-school children and infants. The spacer device used must be compatible with the prescribed metered-dose inhaler.

Use and care of spacer devices

The suitability of the spacer device should be carefully assessed; opening the one-way valve is dependent on the child's inspiratory flow. Some devices can be tipped to 45° to open the valve during inhaler actuation and inspiration to assist the child.

Inhalation from the spacer device should follow the actuation as soon as possible because the drug aerosol is very short-lived. The total dose (which may be more than a single puff) should be administered as single actuations (with tidal breathing for 10–20 seconds or 5 breaths for each actuation) for children with good inspiratory flow. Larger doses may be necessary for a child with acute bronchospasm.

The device should be cleaned once a month by washing in mild detergent and then allowed to dry in air without rinsing; the mouthpiece should be wiped clean of detergent before use. Some manufacturers recommend more frequent cleaning, but this should be avoided since any electrostatic charge may affect drug delivery. Spacer devices should be replaced every 6–12 months.

Nebulisers

Solutions for nebulisation used in severe and life-threatening asthma attacks are administered over 5–10 minutes from a nebuliser, usually driven by oxygen.