

Trainer's Journal Club

February 16, 2006 Discussion Summary
9pm EDT



Facilitator:

Margaret Lester, DIRECTOR OF EDUCATIONAL PROGRAMS

Staff in attendance:

Donna Dayer, MARKETING LIAISON, SPIROMETRY LEAD

Trainers

Edana Christy, NORTH CAROLINA

Sheila Driver, NORTH CAROLINA

Colleen Felts, ILLINOIS

Tammy Foltz, ILLINOIS

Kathy Huber, CALIFORNIA

Jakki Rawlinson, SOUTH CAROLINA

Regrets received from:

Casey Jones

Pam Steele

Pam Ellwood

Melinda Shuler

Agenda

I. Devices update

- **MD Turbo** – not yet released. Get more information at <http://www.respimat.com/com/homepage.jsp>
- **Twisthaler** – NRTC teaching sheet has already been distributed by email. Contact Margaret if you need to have it resent. Trainers agreed that the placebo seems to require a high inspiratory flow – but the actual device is fine and patients do not seem to have any trouble with inhaling through it. Reminder that the Twisthaler is one of the devices on your CD-ROM Respiratory Therapeutics.
- **Respimat** – This device is just in the pipeline. It is being promoted by Boehringer-Ingelheim, but it is not clear what medication will be used in it. More information at <http://www.respimat.com/com/homepage.jsp>
- **Pro-air** (EasiBreathe). This device is being developed by IVAX – now Teva Pharmaceuticals. It will likely be launched with albuterol HFA, but we don't know when that launch will be. We will produce a teaching sheet on this device when it does become available. Reminder that the EasiBreathe is one of the devices on your CD-ROM Respiratory Therapeutics.

II. Medication Updates

- FDA Advisories on **salmeterol, formoterol, Advair**. We discussed the black box warnings on these medications and the FDA advisory reminding providers not to use a long acting β_2 agonist until it is established that you cannot control the patient's asthma with maximum doses of ICS alone. The basis of these

warnings is the SMART study. See link to this study in Additional Reading on the Trainers Journal Club page.

- **Levalbuterol** (Xopenex HFA). This new formulation of Xopenex in an MDI has now been launched. Availability in different parts of the country is still uneven.
- **Mometasone** (Asmanex) – we reviewed dosing of this inhaled corticosteroid, focusing on the importance of giving it in the evening to maximize effectiveness. We also discussed dosing frequency, as this medication is not yet on the Guidelines. See link to article in Additional Reading on Trainers Journal Club page.
- **Ciclesonide** (Alvesco). This is a new corticosteroid which is still in the pipeline. Studies so far show that it does not become active until it reaches the lung tissue, thereby avoiding systemic effects.
- Kathy says her workplace (Kaiser Permanente) has been notified that supplies of **albuterol CFC** may become very short, as major producers of this product are honoring the 2005 ban on CFCs – and HFA capacity is not yet sufficient. No one else in the group had been notified of this impending problem, including Colleen who works with the VA. We agreed this makes it even more critical to get patients onto controller therapy – and to decrease the multiple canisters of albuterol that many people want to have.
- **Pirbuterol** (Maxair) has been off the market recently but appears to be available again. Although we have not seen anything official, it appears that the manufacturer (3M) is planning to reformulate this as an HFA.
- **Primatene Mist** was the subject of an FDA Advisory Panel. The Panel recommended that its “essential use” status be revoked, which would mean a de facto ban on its sale. Wyeth has requested the FDA to delay any ban on this product until it is ready to market a CFC-free version – in 2009 or 2010.

III. Other items of interest

- **Smoking cessation.**

You will find a good smoking cessation program from the NC Northwest Area Health Education Center (AHEC) at

<http://northwestahec.wfubmc.edu/learn/smokingcessation/index.htm>

Colleen has become a trainer for the ALA Freedom From Smoking program.

- **Asthma & Allergy Today,**

We all agreed that it is hard to stay on top of what's new. Kathy finds an item in this publication from Allergy & Asthma Network Mothers of Asthmatics to be helpful – it's a page called What's in Store for 2006? It has predictions from 6 well known health professionals about what they believe is coming in asthma care. http://www.breatherville.org/publications/pu_aat.htm

Margaret urged Trainers to consider writing for any of the range of health magazines and/or journals. Be sure to note that you are an NRTC Trainer if you do have an opportunity to publish. Margaret is also very willing to help with editing – so don't hesitate to ask.

IV. Articles of interest

We did not have time to talk about these articles, but you will find summaries of them below.

- Vaswani et al 1998
- Canadian Asthma Guidelines chapter on devices

V. Future directions for the Trainers Journal Club

- We agreed to try to meet every 2 months, rather than quarterly.
- We agreed to set a topic for each meeting, as this will hopefully allow greater discussion. As appropriate, articles or links will be circulated to provide background material and structure for the discussion.
- Next meeting will be in April 20, 2006. Check website for details.
- April topic: Patient Education: a piece of paper or a process?
- June topic: Asthma control vs asthma severity.

NRTC Trainers Journal Club

Prepared by Margaret Lester

Journal Club Date February 16, 2006

Title

Vaswani SK and Creticos PS (1998). Metered dose inhaler: past, present, future. *Annals of Allergy, Asthma, and Immunology* **80**, 11-21

Article Details

This article used the MEDLINE database to review the English language literature on metered dose inhalers. This review was supported by a grant from Zeneca Pharmaceuticals.

Background and Summary

In 1987, 80 nations signed the Helsinki protocol to eliminate Freons (CFC) by the year 2000. One effect of this agreement was that manufacturers of inhaled respiratory medications had to look at development of new delivery systems.

This paper addresses several delivery devices:

- it contrasts features of conventional MDIs with dry powder inhalers (DPI). (Table 1)
- it discusses various older DPIs (Rotahaler, Spinhaler, Diskhaler)
- it gives technical details of 2 newer DPIs – the Turbuhaler and the Diskus – with a diagram of each.

For this Trainers Journal Club, I have summarized only some of the technical details reported on the Turbuhaler and the Diskus.

Conclusions

Turbuhaler

- No propellants, carriers, additives, or lubricants
- Device assembly has 2 compartments: a storage chamber for the dry powder, and a dosing unit.
- “As the patient inhales...the drug is forced through small conical holes of dosing unit into the inhalational channel. A spiral insert ...inside the mouthpiece generates high air flow resistance and deaggregates the powder to create an aerosol of small particles”. The resistance also slows the flow rate, so particles are less likely to land on the oropharynx.
- Optimum inspiratory flow rates are between 30-60 L/min. Minimum inspiratory flow rate is 30L/minute.
- At an inspiratory flow rate of 50L/minute, approximately 50% of the drug powder particles were <5µg

Diskus

- Drug is mixed with lactose
- Each dose is packed in a foil blister. When the dose is loaded, the “lid foil is dislodged from the base foil and collected on the contracting wheel. Storage area ...holds filled strip, peeled off material, and empty base foil. In case the inhalation does not occur after loading the device, the base foil collection chamber retains the residual powder...”
- Medication can be delivered reliably with the Diskus in any position.
- Acceptable flow rates for reliable delivery are 30-90 L/minute.

NRTC Trainers Journal Club – article summary template

Prepared by Margaret Lester

Journal Club Date February 16, 2006

Title

Becker (2005). Inhalation devices. *Canadian Medical Association Journal* **173**, S39-45

Study Details

This is a review of the literature, looking at inhalation devices. It is a chapter in the Canadian asthma guidelines. The articles reviewed were selected from a MEDLINE search on the following terms: “children,” “asthma,” “inhalation technique,” “HFA,” “aerosols,” “patient education,” and “asthma education.”

Background

This chapter has sections on HFA propellants, holding chamber properties, relative dosing, teaching children to use inhalers, age and devices, cognitive state – crying, awake, asleep, face mask v. mouthpiece, wet nebulizers in acute care, wet nebulizers in the chronic setting, and β -adrenergic medications do not enhance deposition of ICS. Key points from each section are summarized below.

Note: Information in this article that is not directly relevant to the US has been omitted, particularly information on medication/device combinations that are not available here.

Summary

Hydrofluoroalkane (HFA) propellants

- The number and size of drug particles delivered is influenced by various design details of the different pressurized metered dose inhaler (pMDI) devices. Generally particle size ranges from 1-4 μ m.
- “...particle delivery to the lung may be increased 50% of the nominal dose for QVAR, an HFA propellant solution of beclomethasone dipropionate (BDP) but remain at 10-20% for HFA suspension formulations such as fluticasone and salbutamol [albuterol]”
- Deposition of HFA BDP is more peripheral because of smaller particle size (1 μ m), compared with CFC fluticasone 2 μ m.
- Optimum particle size for adults of ipratropium or [albuterol] is 2.8 μ m (compared with 1.5 μ m or 5 μ m) – but it has been harder to establish ideal particle size in ICS.
- Using a valved holding chamber with HFA BDP does not change lung deposition, but reduces oropharyngeal deposition 5-fold.

Holding chamber properties

Spacer size

- The size of the spacer may be important, depending on the age of the child. For example, the valve may be too stiff, or the dead space in the chamber too large. In tests using CFC pMDIs, different spacers delivered significantly different amounts of fine particles. The specific medication also affected delivery in a given holding chamber.
- It appeared that spacer size may not matter as much with HFA [albuterol].

Electrostatic properties

- Electrostatic charged on spacers significantly reduces the amount of drug delivered to the patient, compared to the metal Nebuchamber. [Vortex is the metal spacer available in the US].
- An alternative is to lightly coat the inside of the plastic spacer with liquid detergent.

- Oropharyngeal dose may be higher using metal spacers as more of the larger particles are available for inhalation – not stuck to the sides of the spacer.

Inhalation delay and multiple actuations

This section was a bit hard to interpret, as it was not clear whether only large volume spacers were tested, or if small volume spacers such as we have in the US were included as well. However, several important issues were raised, which we should be aware of.

- A 20 second delay in inhalation after actuation significantly reduced the amount of [albuterol] reaching the lungs of adults tested using a large volume spacer.
- In an in-vitro study, a 20 second delay decreased small particle emission significantly.
- Actuating multiple puffs into the spacer before inhalation also decreased particle emission significantly.

Relative dosing

Most of the material in this section does not apply in the US – as medications are not available in the devices studied. The only item which is comparable in the US is the finding that the relative efficacy of [albuterol] via the wet nebulizer compared to the MDI/spacer in children is 5:1 – that is 500 mg* of [albuterol] via the wet nebulizer is equivalent to 100 mg via MDI/spacer. It is suggested that newer nebulizer technologies with a tight-fitting mask may be more efficient, resulting in a ratio of 2:1. However, in a real life situation, it may be difficult to keep a tight-fitting mask on an infant for the full duration of the nebulizer treatment. [*it is not clear if they actually tested these drugs at these high doses. The usual adult dose of albuterol given by nebulizer is 2.5-5mg – or 250-500 mcg]

Inhalation techniques – teaching children to use an inhaler

Again, only a few points relevant to the US are reported.

- With nurse teaching, children 4-5 years old were able to learn to use the Turbuhaler properly, but 3 year olds were not.
- Proper technique consists of many elements. Some really do matter – such as taking the cap off. Others may not matter – such as tilting the head and breath holding. This reinforces the need to base our teaching on the evidence base – not just on what we have always heard.
- Cost and complexity are significant barriers to medication use. Before insisting on a spacer (which increases the costs and is bulky) see if the patient can use a single, simpler device correctly.
- “Comprehensive instructions combined with repeated checks of proper technique in the pharmacy or clinical trial setting dramatically increased good performance, from 39% (general practitioner demonstration only) to 79% and 93% respectively.”

Age and devices

- In children, the Turbuhaler can be used at inspiratory flow rates of as low as 30L/min. However, twice the effect is produced at 60L/min.
- For jet nebulized medications, infants received much less of the medication than did 6-18 year olds. If the flow rate of the nebulizer exceeds the maximum inspriatoy flow of the infant, then the medication will be lost to the atmosphere during inhalation.
- If a child uses a mask, deposition decreases as well.
- Although auto-scaling appears to happen, It is not clear how appropriate it is to use the same dose for all ages.

Cognitive state—crying, awake, asleep

- “Drug delivery was decreased by 2/3 in infants who were distressed compared with infants who were calm during inhalation when using a holding chamber and face mask.”
- A high percentage of infants cry while receiving therapy – so it may be better to use an MDI and spacer which can be used for a much shorter time than a wet nebulizer.

Interface – face mask v mouthpiece

- In children using a nebulizer, it is clear that breathing through the nose while wearing a mask decreases lung deposition significantly compared with using a mouthpiece.
- Thus it is a good idea to switch to a mouthpiece as soon as the child is able.
- Leaks in the mask also reduces drug deposition, especially when the leak occurs near the nose compared with near the chin.
- If the dead space of the mask is similar to the tidal volume of the infant, little drug will reach the lungs.

Wet nebulizers in acute care

- Nebulizer and MDI/spacer have been shown to be equally effective in studies of children – in terms of admission rates, length of stay in the ER, and pulmonary function.
- Cost of the nebulizer is significantly greater, although if personnel must stay with the patient teaching and monitoring MDI technique, the savings may be much less.

Wet (jet) nebulizers in the chronic setting

- Debate continues over the value of nebulizers in chronic asthma
- Compressor size may decrease compliance
- Particle size from wet nebulizers varies greatly, depending on the device and the compressor

 β -adrenergic medications do not enhance deposition of ICSs

- No studies have validated the common recommendation to take the beta agonist first to open up the airways.
- CMA guidelines recommend using the most important medication first