Are spacer devices the most effective treatment option for patients with asthma?

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Importance of this Research

We chose to research the effectiveness of spacer devices because we recognized major issues that are surrounding the standard-prescribed metered-dose inhalers. Throughout our research, we discovered that metered-dose inhalers do not always effectively deliver medication to a patient's lungs due to the increased need for hand-breath coordination and a higher risk of developing oral thrush. We wanted to learn more about the benefits of using a spacer device to include mechanics behind the delivery of medication, how cost effective it is to patients and facilities, its effects of hospital admission and readmission rates, and patients overall device preference.

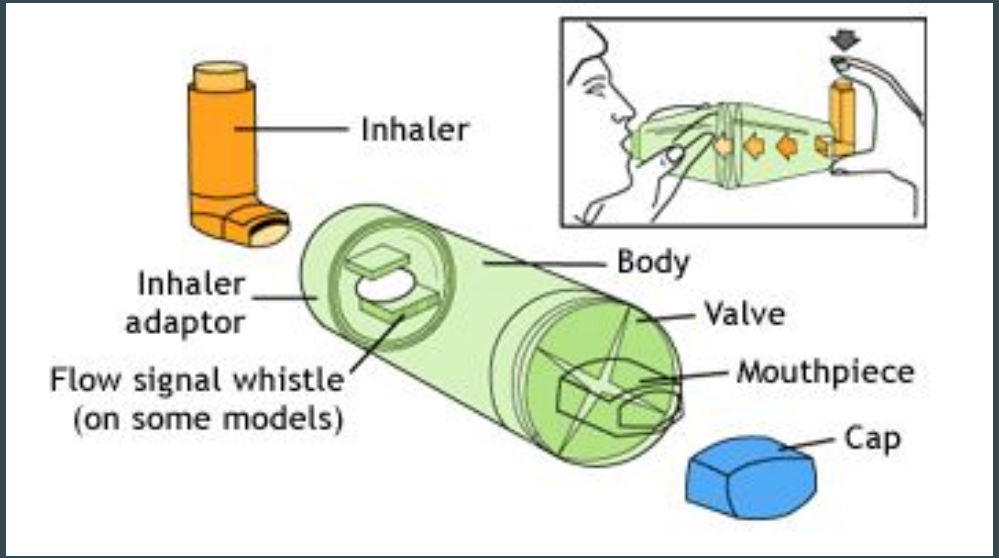
Inhalation Medication Administration Methods

- Metered dose inhalers (MDI)
- Breath actuated aerosol inhalers
- Dry powder inhalers
- Nebulizers
- Spacer devices

Rees, J. (2005, September 3). Methods of delivering drugs. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1199035/

How does the spacer device help deliver medication?

- After a patient presses down on the inhaler, they usually have to time it just right in order for the medication to effectively reach their lungs.
- A spacer holds the “puff” of medication in the device so that there is more time for it to be inhaled slowly and more completely.
- This enables the medication to be inhaled directly into the lungs.



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Benefits of Using a Spacer Device

- Provides asthma patients with a simpler concept to learn and understand
- Reduces the need for coordination between pressing the inhaler and breathing in
- Devices contains a whistle that indicates to patients if they inhaled too quickly for medication to properly administer
- Allows for a greater concentration of medication to be absorbed into the lungs
- Reduces the risk for oral thrush
- Reduces unwanted swallowing of drug and gastrointestinal absorption
- Saves more medication

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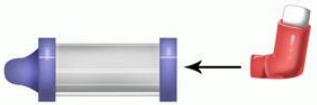
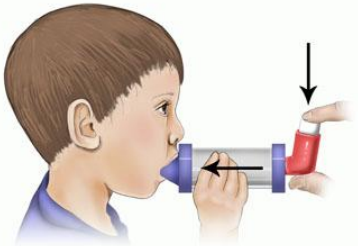
How to Use a Metered-Dose Inhaler with a Valved Holding Chamber (Spacer)

1. Shake the medicine.



2. Insert the mouthpiece of the inhaler into the rubber-sealed end of the spacer.

3. Breathe all of the air out of your lungs. Then put the spacer into your mouth between your teeth. Make a tight seal around the mouthpiece with your lips.



4. Press the metered-dose inhaler down once to release a spray of medicine. The medicine will be trapped in the spacer. Breathe in slowly and deeply.

5. Hold your breath for 5 to 10 seconds and then breathe out slowly. If you cannot hold your breath, another method is to breathe in and out slowly for 3 to 5 breaths.

Cost Effectiveness of Spacers

- For Patients:
  - A study in Nova Scotia concluded that patients save around $24 when they use an MDI with spacer device compared to a nebulizer machine.
    - Over 800 patients who went to the pediatric emergency department were used in this study.
- In the hospital setting:
  - Spacers were found to offer a more cost effective option for asthma patients in the hospital when compared to a nebulizer machine.
    - The AAP study concluded an average savings of $154.95 per patient.
- Overall:
  - By decreasing the costs in hospitals, health care systems and families also experience an overall cut in their treatment costs as well.

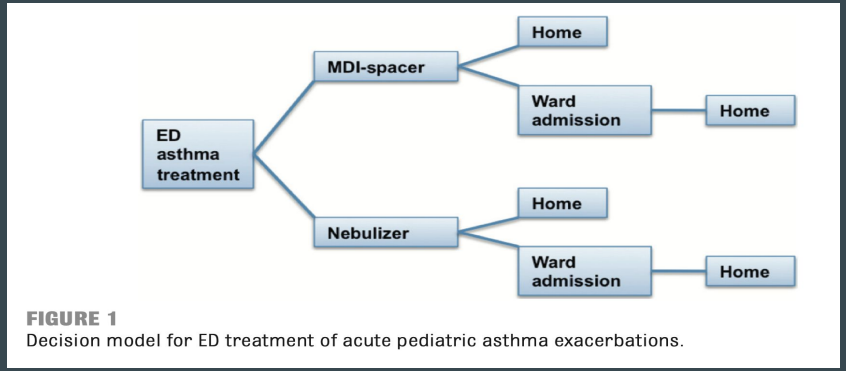


FIGURE 1
Decision model for ED treatment of acute pediatric asthma exacerbations.

Figure 1: Dewar AL, Stewart A, Cogswell JJ, Connett GJ. A randomised controlled trial to assess the relative benefits of large volume spacers and nebulisers to treat acute asthma in hospital. Arch Dis Child. 1999;80(5):421–423. doi:10.1136/adc.80.5.421

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Use of Spacer Devices on Hospital Admission Rates

The study in Nova Scotia also concluded those who chose to use a MDI with a spacer as treatment versus those who use nebulizers saw a decrease in the need for hospitalization by 4.4% as well as a reduction in the average inpatient stay by 25 hours.

Another study done that was randomized at a children's emergency department looked into children ages 1-4 taken to the hospital.

- The study concluded that children using a nebulizer saw an admission rate of 60% and an admission rate of 33% for those who were using MDIs with spacers.

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Leversha, A. M., Campanella, S. G., Aickin, R. P., & Asher, M. I. (2004, July 23). Costs and effectiveness of spacer versus nebulizer in young children with moderate and severe acute asthma. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0022347600900131?via=ihub

Use of Spacer Devices on Hospital Readmission Rates

When comparing hospitalizations among patients who use MDIs with spacers and those who use nebulizers, it was found that those who use MDIs with spacers experience less readmission rates to hospitals.

- A study completed over a 12 month period at Southampton University Hospital and Poole District General Hospital on children over the age of 3 found patients who used the spacer had a readmission rate of 13.8% when the nebulizer group had a readmission rate of 27.2%.
    - In the study, there was no significant difference found in clinical characteristics and severity of the attack among the groups when admitted the first time.

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Parent and Child Preference

A study completed over a 3 month period at the Sydney Children's Hospital emergency department was done to find parent and child satisfaction with different asthma treatment options.

- 158 parents were surveyed and 84% reported they found a spacer easy to use and that they intended to use it at home.
  - Of the parents who previously had nebulizers for their children, 84% said they would be switching to spacers
    - Majority also reported that their children tolerated this treatment better than a nebulizer
- 30 children were between the ages of 8-14 and 82% of them reported the spacer being easier or quicker to use compared to other treatment options.

Cotterell, E. M., Gazarian, O'Meara, M. W., & RL Henry. (2002, November 13). Child and parent satisfaction with the use of spacer devices in acute asthma. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1046/j.1440-1754.2002.00063.x

Adult Preference

A study was done over 2.5 years in a large urban emergency department to research adult satisfaction with treatment when using MDIs with spacers versus nebulizer treatments.

- Patients in the group treated with MDIs with spacers experienced a great improvement in their peak-flow when compared to the other treatment group.
- These patients also rated high satisfaction due to experiencing a shorter time in the hospital when using a spacer device with a MDI.

Metered-Dose Inhalers vs. Nebulizers in Treating Asthma. (2002, October 1). Retrieved from https://www.aafp.org/afp/2002/1001/p1311.html

Conclusion

Overall, MDIs with spacers have been found to be favored among all ages of patients. The addition of a spacer has been found to be more cost effective for hospitals and patients when compared to other forms of medication delivery. Also, spacers have been linked to lower hospital admissions as well as lower hospital readmissions when compared to other treatment options.

References

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