

**SPEAKERS - DR CHANDREYEE BHATTACHARYA , DR VIVEK SAXENA , DR ARUN MANGLIK**

## **Introduction**

Inhalation therapy has been a cornerstone in treating respiratory conditions, with roots tracing back to ancient civilizations. Today, two primary methods dominate pediatric respiratory care: nebulizers and Metered Dose Inhalers (MDIs) with spacers. Each has its advantages and limitations, prompting ongoing discussion among healthcare professionals about the most effective option for specific clinical situations. This article explores the comparative benefits of these devices, factors influencing drug delivery, and practical insights for pediatric use.

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## **Historical Context of Inhalation Therapy**

Inhalation therapy has evolved significantly over the centuries. Historical references from Indian, Chinese, Greek, and Egyptian texts describe the use of inhaled substances for health benefits. Early methods, such as burning powders or smoking specific herbs, were rudimentary. By the late 19th century, standardized inhalation devices began to emerge, setting the stage for modern nebulizers and MDIs.

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## **The Role of Particle Size in Drug Delivery**

Effective drug delivery depends heavily on the size of aerosol particles. Larger particles (above 5 microns) are typically deposited in the upper airways, while smaller particles (1-5 microns) can reach the mid and lower airways. Particles under 1 micron may pass through the alveoli but are often exhaled without therapeutic benefit. This distinction underscores the need for precision in device selection to ensure optimal therapeutic outcomes.

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## **Comparing Nebulizers and MDIs with Spacers**

### **Efficiency and Cost**

MDIs with spacers offer significant advantages in cost, portability, and ease of use. A typical MDI with a spacer is more affordable than nebulizers and does not require electricity or an oxygen source. The portability of MDIs also makes them convenient for home and travel use.

### **Drug Delivery**

Nebulizers are effective in delivering medication during severe respiratory distress, especially in uncooperative or very young children. However, modern MDIs with spacers and valve systems achieve superior drug deposition in the airways with reduced oropharyngeal deposition. Studies show that MDIs deliver approximately 20-30% of the drug to the lungs compared to 10-15% for nebulizers.

### **Maintenance and Infection Risk**

Spacers are easier to clean and maintain, reducing the risk of bacterial and fungal infections. In contrast, nebulizers require meticulous cleaning of tubing and masks, which is often neglected, increasing the risk of infections.

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## **Practical Strategies for Pediatric Use**

### **Addressing Uncooperative Children**

Administering inhalation therapy to crying or resistant children is challenging. While nebulizers remain effective in such cases due to their passive delivery mechanism, MDIs with spacers can be used during calmer moments or even while the child is asleep. Ensuring a tight seal and using tidal breathing can enhance the effectiveness of MDIs.

### **Homemade Solutions**

For families unable to afford commercial spacers, homemade options like modified bottles or thermocol cups can act as temporary substitutes. While less effective than commercial devices, these alternatives can provide a functional solution in resource-limited settings.

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## **Environmental Considerations**

The use of propellants in MDIs raises concerns about their carbon footprint. Transitioning to environmentally friendly alternatives, such as dry powder inhalers (DPIs) and mist inhalers, is becoming a priority. These devices eliminate the need for harmful propellants and offer comparable therapeutic efficacy. Additionally, encouraging the return of used canisters for recycling can help mitigate environmental impact.

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## **Patient Education and Counseling**

### **Dispelling Myths**

A common misconception among parents is that inhalation devices cause addiction. Educating families about the safety and efficiency of MDIs, particularly their reduced systemic drug exposure compared to oral medications, is essential. Highlighting the

significantly lower dosages required for inhalation therapy can further address concerns about side effects.

### **Overcoming Resistance to Change**

Families accustomed to nebulizers may resist transitioning to MDIs. Counseling should focus on the benefits of MDIs, such as quicker administration times, portability, and cost savings. Demonstrating the correct use of MDIs during consultations can also build confidence among caregivers.

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## **Questions and Answers from the Webinar**

### **What are the factors affecting drug delivery in children?**

Key factors include the child's age, respiratory rate, and cooperation level. Younger children with rapid breathing may experience reduced drug deposition due to dead space ventilation. Proper synchronization of inhalation and drug actuation, as well as the use of appropriate spacer sizes, can improve outcomes.

### **How can drug deposition in the oropharynx be minimized?**

Rinsing the mouth or drinking water after using inhalation therapy can prevent complications like dysphonia and oral candidiasis. Using a spacer further reduces oropharyngeal deposition compared to direct MDI use.

### **Are homemade spacers effective?**

Homemade spacers, such as modified bottles, can serve as temporary solutions. While they are less efficient than commercial devices, studies indicate they still achieve basic drug delivery goals.

### **How do mist inhalers compare to traditional MDIs?**

Mist inhalers, a newer technology, offer propellant-free drug delivery with comparable efficacy. They represent a promising alternative, particularly for reducing environmental impact.

### **What is the future of inhalation therapy?**

Global trends point toward increased use of DPIs and mist inhalers due to their environmental benefits and ease of use. Efforts are also underway to improve the sustainability of MDIs by using low global warming potential propellants.

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## **Conclusion**

Both nebulizers and MDIs with spacers are valuable tools in pediatric respiratory care. While nebulizers are indispensable for acute cases and uncooperative children, MDIs with spacers offer numerous advantages, including cost-effectiveness, ease of use, and reduced side effects. Educating families, addressing environmental concerns, and embracing innovative

technologies like mist inhalers will ensure the continued evolution and effectiveness of inhalation therapy in pediatrics.