Paramedic – Evidence Based Medicine (P-EBP) Program

Paramedic CAT (Critically Appraised Topic) Worksheet

Title: *Is using a metered dose inhaler and spacer (MDI+S) superior to using a nebulizer when delivering Ventolin?*
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Clinical Scenario:

You arrive at the scene of a single-family home and are presented with a ten y/o female patient who is complaining of shortness of breath. Vital signs include a respiratory rate of 30 breaths per minute, a heart rate of 140 beats per minute, and a Sp02 of 89% on room air. Your assessment reveals that she uses accessory muscles to aid her breathing and an expiratory wheeze on auscultation. Her medical history includes asthma, and she takes Ventolin PRN. Today, she has not been able to find her inhaler, and her mother tells you this is just like her previous asthma attacks, but they have lost her medication as she has not had an exacerbation in some time.
You choose to treat the patient with Ventolin and remember that before the COVID-19 pandemic, you would use a nebulizer to administer the medication. However, during the pandemic, your employer mandated that you deliver the medication via MDI+s. In a recent guideline update, you noted that nebulization is permitted again, and your car is stocked with both options. You want to know if one delivery method benefits the other in reducing dyspnea symptoms.

PICO (Population – Intervention – Comparison – Outcome) Question:

When treating the pediatric population for an asthma exacerbation with Ventolin. Is using the MDI with a spacer superior to using a nebulizer when evaluating the reduction in dyspnea?

P: Pediatric patients experiencing asthma exacerbation. I: Treated w. Ventolin. C: MDI w. spacer vs. Nebulizer. O: reduction of symptoms.

Search Strategy:

((((emergency medical services OR emergency medical technician OR paramedic OR prehospital OR pre-hospital OR "out of hospital" OR responder* OR ambulance) AND (asthma OR "shortness of breath" OR dyspnea OR exacerbation OR*

breathlessness OR wheez OR)) AND (Ventolin)) AND ("Metered dose inhaler" OR MDI OR inhaler)) AND (nebuliz* OR atomiz* OR atomis*)*

Search Outcome: *24 results*

Relevant Papers:

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESIGN (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Payares-Salamanca, 2020	*Asthma exacerbation in pediatric patients, from fifteen studies (n = 2057)*	*Level 1*	*Neb albuterol vs MDI albuterol* *Admittance to hospital post ER visit, 02 sat, HR, RR, Pulmonary index score, adverse effects and need for additional treatment*	*Hospital admission (relative risk, 0.89; 95% confidence interval [CI], 0.55–1.46; I 2 = 32%; p = .65)* *PIS score (mean difference [MD], −0.63; 95% CI, −0.91 to −0.35; I 2 = 0%; p < .00001* *Smaller increase in HR (better; MD −6.47; 95% CI, −11.69 to −1.25; I 2 = 0%; p = .02)* *When albuterol was delivered through MDI+S then when it was delivered through NEB*	*Weaknesses:* *1 poor inclusion of bias RCT, lack of follow-up on outcome measures, lack of subgroup variability/ availability.* *Strengths:* *readability, 15 RCTs, included a good amount of non-bias articles*
Iramain, 2018	*Moderate-severe asthma exacerbation*	*Level 2*	*02 sat, HR, RR, Pulmonary index*	*Pulmonary Score 4h 2.5 ± 1.0 4.15 ± 0.9 <0.00001*	*Weaknesses:* *Did not report on*

	in pediatric patients (n = 52)		*score, adverse effects*	*MDI is better. Oxygen saturation4 h 95.3 ± 2.0 91.9 ± 1.9 <0.00001 MDI better by 2% Adverse effects (tachycardia) 4 h 144.7692 ± 6.50 172.20 ± 9.52 <0.00001 NEB increase risk of tachycardia by 28 at 4-hour mark.*	*additional treatments required, no control group (not possible), excluded multi system disorders.* *Strengths: readability, included a good population size with strong exclusion criteria.*

Comments:

The meta-analysis by Payares-Salamanca, 2020 noted the use of MDI+S during the COVID-19 pandemic. The literature recommends that this method be continued during any respiratory virus pandemic.

Consider:

Due to the ongoing prevalence of COVID-19, it would be prudent to continue the delivery of Ventolin via MDI+s.

Clinical Bottom Line:

Using an MDI+S to deliver Ventolin has indicated marginal improvements when treating dyspnea in the pediatric population. However, there needs to be evidence to support that Ventolin provided by nebulization is inferior and that both delivery routes are acceptable.

References:

Iramain, R., Castro-Rodriguez, J., Jara, A., Cardozo, L., Bogado, N., Morinigo, R., & De Jesús, R. (2019). Salbutamol and ipratropium by inhaler is superior to nebulizer in children with severe acute asthma exacerbation: Randomized clinical trial. *Pediatric Pulmonology, 54*(4), 372-377. https://10.1002/ppul.24244

Payares-Salamanca, L., Contreras-Arrieta, S., Florez-García, V., Barrios-Sanjuanelo, A., Stand-Niño, I., & Rodriguez-Martinez, C. (2020). Metered-dose inhalers versus nebulization for the delivery of albuterol for acute exacerbations of wheezing or asthma in children: A systematic review with meta-analysis. *Pediatric Pulmonology, 55*(12), 3268-3278. https://10.1002/ppul.25077