Breath Actuated Nebulizer Improves Quality of Care in Pediatric Emergency Department Asthma and Leads to System Wide Implementation

Christine J.H. Bong, MD, MPH, Maya Eady, MD, C. Michael Bowman, MD, M. Olivia Titus, MD.
Department of Pediatrics, Medical University of South Carolina, Charleston, South Carolina

Purpose of Study

Background:

- Breath actuated nebulizers have improved asthma care in adults.
- Children's Hospital and Research Center at Oakland- reduced clinical asthma scores (CAS), hospitalization rates, and respiratory rates with AeroEclipse II Breath Actuated Nebulizer (BAN).

Objective:

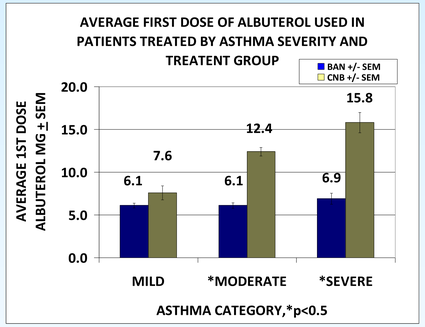
- To determine if albuterol delivery via BAN vs. conventional continuous nebulizer optimizes care and reduces cost in pediatric patients treated for wheeze/asthma in the MUSC Pediatric Emergency Department.

Methods/Design

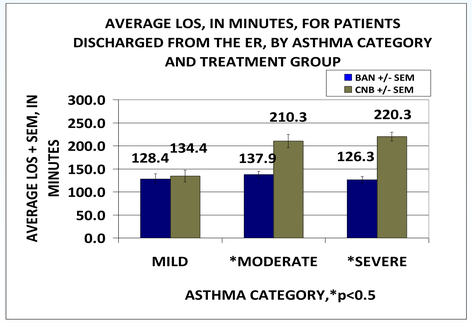
- Convenience sample of patients 1-18 years, with wheeze/asthma from May-November 2008
- Patients received ALB via BAN (2.5mg if 5-10kg, 5mg if 10-20kg, 7.5mg if >20kg) or CNB (10mg or 15mg)
- Patients unable to actuate BAN were converted to cont ALB delivery.
- Stratified by CAS: MILD (CAS 0-2), MOD (CAS 3-6), SEVERE (CAS 7-10).
- Comparison of means ± SEM using unpaired Students T-test to compare groups by length of stay (LOS), initial CAS, change in CAS after first treatment, dose of first ALB (mg), and hospitalization rate.
- Estimate of cost savings were based on 2007 hospital wide albuterol administration using the CNB, accounting for device cost and respiratory therapist (RT) billed therapy time.
- Implementation of education component initiated to introduce device and benefits to hospital staff and faculty

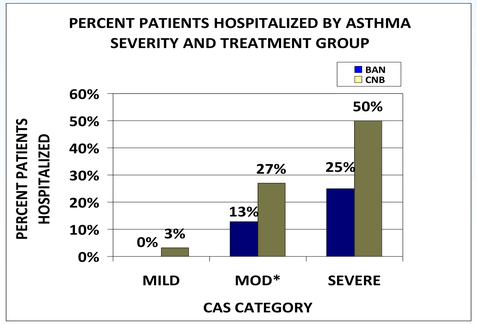
Results

CHARACTERISTICS	CNB	BAN
N	114	61
CAS, N(%)		
MILD	31 (27.2)	18 (29.5)
MOD	71 (62.3)	39 (63.9)
SEVERE	12 (10.5)	4 (6.6)
GENDER, N(%)		
MALE	74 (64.9)	41 (67.2)
FEMALE	40 (35.1)	20 (32.8)
CONTROLLER, N(%)		
YES	52 (45.6)	13 (21.3)
NO	62 (54.4)	48 (78.7)



AVERAGE CAS, BY TREATMENT GROUP & CAS CATEGORY, PRE AND POST 1ST DOSE ALBUTEROL	CNB	BAN
MILD, PRE	1.3± 0.3	1.5 ± 0.1
MILD, POST	0.6 ± 0.15	0.9 ± 0.15
MOD, PRE	3.8 ± 0.11	3.7 ± 0.16
MOD, POST* (p<0.05)	2.2 ± 0.11	1.6 ± 0.21
SEVERE, PRE	6.6 ±0.19	6.0 ± 0
SEVERE, POST	4.0 ± 0.19	3.0 ± 0.41





Conclusions

- Greater first response, significant & ~50% lower CAS after 1st treatment in MOD exacerbation, despite fewer patients on inhaled controller therapy.
- Fewer hospitalizations, ~ 50% fewer admits for MOD
- Shorter LOS, significant in MOD and SEVERE groups
- BAN treated patients spent ~1/3 less time in PED (54-72 min shorter LOS)
- Decreases wait time for PED care with more rapid room turn over
- Improved delivery, less waste
  - -Decreased ambient loss of medication: BAN ~4% vs. ~30% with CNB
  - -Reusable device can be used for up to 1 week in hospital or home
  - -Moderate group used 50% less albuterol per treatment compared to CNB group
- Cost savings to hospital -Est $118K labor savings, incl cost of device, by cutting each treatment by 5 minutes.

Impact, Education & Goals

- Multidisciplinary approach was critical to device implementation and adoption
- Cost savings resulted in implementation in the PED, the Children's Hospital, and the MUSC adult hospital system.
- Reduce treatment time on wards, better utilization of RT time
- Reducing PICU admissions
  - -by reducing severity of patient transferred from the ED
  - -shorter treatments allow more severe asthmatics to be floor managed
- In-service seminars target learning needs of residents & nursing staff
- Access to RTs, skilled in use of device, to demonstrate and answer questions concerning device use has eased transition
- Video presentation, demonstrating proper use, is being developed to aid RTs in educating patients and their parents.
- Implementation of video and handouts will aid parents to assist in treatment administration, saving critical RT time, and further reducing cost.

Contact Information: Christine J.H. Bong, MD
MUSC Department of Pediatrics 165 Ashley Ave Charleston, SC 29425 bong@musc.edu