

## 45th Biennial Convention (16-20 November 2019)

### Breathe In, Breathe Out...Now What? Improving Pediatric Asthma Outcomes Through Improved Inhaler Technique

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Asthma is a chronic disease affecting families in the United States; especially pediatric patients aged 5-18. The local prevalence of asthma is 15.7% versus 12.2% statewide and 8.4% nationally. These patients miss school days thus causing parental workday loss. This represents a significant socio-economic problem in the community.

Unexpected clinic visits, as well as emergency room visits due to asthma, contribute to rising healthcare costs both locally and nationally. Unexpected asthma visits are a leading reason for visits to this author's clinic.

Asthma is treated with inhaled medications through a metered dose inhaler. It is imperative for patients to know how to use an inhaler. The problem in this population is a lack of proper education and teaching of how to use an inhaler. A review of the evidence indicated that most patients do not correctly utilize an inhaler, leading to decreased medicine effectiveness and poor patient outcomes. At the author's clinic, verbal inhaler technique education was provided but was not measured for effectiveness. Therefore, the question arises, in pediatric patients with asthma, how does the addition of hands-on inhaler education compared to only verbal inhaler education affect inhaler technique, appropriate utilization of medications, clinic exacerbation visits, ER utilization, school attendance, and parent work attendance over a 3-month period of time?

Based on the problem ineffective inhaler technique is due to lack of inhaler education.

This scholarly project supported on EBP contained a fundamental component of nursing and provider education related to proper inhaler use and how to teach inhaler technique. Following education of nursing and provider staff, patients were instructed on correct inhaler technique. Expected outcomes measured in this project included improved inhaler technique, tightened asthma control, decreased asthma exacerbation visits to both clinic and emergency room and decreased missed school and parental work days.

The scholarly project started in July 2018 with data collection terminating October 19, 2018 but program continues to run in clinic. 312 asthmatic patients aged 5-21 prescribed an MDI were seen during this time; with 518 individual encounters. However, 63% of the patients did not receive the education either due to missed opportunities or provider declining to participate. 2 case studies will be reviewed to emphasize ownership of asthma care vs non-ownership of asthma care.

**Inhaler technique.** Prior to education, only 25 patients could correctly use an inhaler. After education, 116 patients could perform all 8 steps of inhaler technique correctly. 13 patients had a second educational encounter and 69% of the patients were not able to correctly utilize an inhaler again. These results correlate with the evidence that patients must have continued encounters to continue to learn proper inhaler technique. The

patients also improved their inhaler technique by at least 1 step which was also noted in the literature.

**Asthma Control:** 120 patients participated in asthma control test (ACT) at visit one with 13 patients participating at visit 2. At both visits; 23% of the patients noted poor asthma control.

**Decreased health care utilization and missed school days:** The three months of implementation time did not allow for adequate assessment of these metrics. Further follow up and evaluation will be required.

**Discussion:** Patients were offered a new method of inhaler technique training that was based upon an evidence-based process project. The patients were able to improve inhaler technique by at least 1 step with the training, but as noted in the evidence, will need to have education at continued intervals to continue to improve technique. Sustainability of this project is indicated and is ongoing for continued improvement in asthma outcomes. With sustainability the author's clinic will be able to measure the outcome metrics of asthma control, quality of life, health care utilization and missed school and work days. An Asthma Medical Home is now underway at this author's clinic.

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**Title:**

Breathe In, Breathe Out...Now What? Improving Pediatric Asthma Outcomes Through Improved Inhaler Technique

**Keywords:**

Evidence Based Practice, Improved Patient Outcomes and Pediatric Asthma

**References:**

- Alexander, D.S., Geryk, L., Arrindell, C., DeWalt, D.A., Weaver, M.A., . . . Carpenter, D.M. (2016). Are children with asthma overconfident that they are using their inhalers correctly? *Journal of asthma*, 53(1), 107-112. doi: 10.3109/02770903.2015.1057848
- Amirav, I., Goren, A., Kravitz, R.M., & Pawlowski, N.A. (1994). Physician-targeted program on inhaled therapy for childhood asthma. *Journal of allergy and clinical immunology*, 95(4), 818-824. (seminal reference)
- Burkart, P.V., Rayens, M.K., Bowman, R.K. (2005). An evaluation of children's Metered-Dose Inhaler technique for asthma medications. *Nursing clinics of North America*, 40, 167-182. doi: 10.1016/j.cnur.2004.08.010 (seminal reference)
- Capanoglu, M., Dibek Misirlioglu, E., Toyran, M., Civelek, E., & Naci Kocabas, C. (2015). Evaluation of inhaler technique, adherence to therapy and their effect on disease control among children with asthma using metered dose or dry powder inhalers. *Journal of asthma*, 52(8), 838-845. doi: 10.3109/02770903.2015.1028075
- Carpenter, D.M., Lee, C., Blalock, S.J., Weaver, M., Reuland, D., . . . Sleath, B.L. (2015). Using videos to teach children inhaler technique: A pilot randomized controlled trial. *Journal of asthma*, 52(1), 1532-4303. doi: 10.3109/02770903.2014.944983
- Carpenter, D.M., Alexander, D.S., Elio, A., DeWalt, D., Lee, C., & Sleath, B. (2016). Using tailored videos to teach inhaler technique to children with asthma:

Results from a school nurse-led pilot study. *Journal of pediatric nursing*, 31, 380-389. doi: 10.1016/j.pedn.2016.02.005

deGroot, E.P., Kreggemeijer, W.J., & Brand, P.L.P. (2015). Getting the basics right resolves most cases of uncontrolled and problematic asthma. *Acta paediatrica*, 104, 916-921.

Duerden, M., & Price, D. (2001). Training issues in the use of inhalers. *Disease management and health outcomes*, 9(2), 75-87. <https://doi.org/1173.8790/01/0002-0075/S22.0010> (seminal reference)

Foland, A.P., Stern, T., Ramacciotti, T., Martin, J., Gilbert, I., & Cohn, R. (2002). Improvement of metered-dose inhaler administration technique: The effect of training sessions at a specialized pediatric asthma compliance and technique clinic. *Current therapeutic research*, 63(2), 142-147. (seminal reference)

Gillette, C., Rockich-Winston, N., Kuhn, J.A., Flesher, S., Shepherd, M. (2016). Inhaler technique in children with asthma: A systematic review. *Academic pediatrics*, 16(7), 605-615.

Janssen, C.L.W., Spoelstra, A.S., Brueren, M.M. (2003). Asthmatic children's inhalation techniques in general practice. *European journal of general practice*, 9, 143-145.

Jones, J.S., Holstege, C., Riekse, R., White, L., & Bergquist, T. (1995). Metered-Dose inhalers: Do emergency health care providers know what to teach? *Annals of emergency medicine*, 26(3), 309-312. (seminal reference)

Kamps, A.W.A., van Ewijk, B., Roorda, R.J., & Brand, P.L.P. (2000). Poor inhalation technique, even after inhalation instructions, in children with asthma. *Pediatric pulmonology*, 29, 39-42. (seminal reference)

Levy, M.L., Hardwell, A., McKnight, E., & Holmes, J. (2013). Asthma patients' inability to use a pressurized metered-dose inhaler (pMDI) correctly correlates with poor asthma control as defined by the Global Initiative for Asthma (GINA) strategy: a retrospective analysis. *Primary care respiratory journal*, 22(4), 406-411. doi: 10.4104/pcrj.2013.00084

Manriquez, P., Acuna, A.M., Munoz, L., & Reyes, A. (2015). Study of inhaler technique in asthma patients: differences between pediatric and adult patients. *Journal Brasil pneumol*, 41(5), 405-409. doi: 10.1590/S1806-3713201500000014

Minai, B.A., Martin, J.E., & Cohn, R.C. (2004). Results of a physician and respiratory therapist collaborative effort to improve long-term Metered-Dose Inhaler technique in a pediatric asthma clinic. *Respiratory care*, 49(7), 600-606. (seminal reference)

Munzenberger, P.J., Thomas, R., & Bahrainwala, A. (2007). Retention by children of device technique for inhaled asthma drugs between visits. *Journal of asthma*, 44, 769-773. doi: 10.1080/02770900701645793 (seminal reference)

Pedersen, S., Dubus, J.C., Crompton, G. (2010). The ADMIT series- Issues in inhalation therapy. 5) Inhaler selection in children with asthma. *Primary care respiratory journal*, 19(3), 209-216. doi: 10.4104/pcrj.2010.00043

Price, D., Bosnic-Anticevich, S., Briggs, A., Chrystyn, H., Rand, C., . . . Bousquet, J. (2013). Inhaler competence in asthma: Common errors, barriers to use and recommended solutions. *Respiratory medicine*, 107, 37-46. doi: 10.1016/j.rmed.2012.09.017

Reznik, M., Jaramillo, Y., & Wylie-Rosett, J. (2014). Demonstrating and assessing metered dose inhaler-spacer technique: Pediatric care provider's self-reported practices

and perceived barriers. *Clinical pediatrics*, 53(3), 270-276. doi: 10.1177/00092281312521

Rodriguez-Martiney, C.E., Sossa-Briceno, M.P., & Nino, G. (2017). A systematic review of instruments aimed at evaluating metered dose inhaler administration technique in children. *Journal of asthma*, 54(2), 173-185. doi: 10.1080/02770903.2016.1198373

Schmier, J.K., Manjunath, R., Halpern, M.T., Jones, M.L., Thompson, K., & Diette, G.B. (2007). The impact of inadequately controlled asthma in urban children on quality of life and productivity. *Annals of allergy asthma and immunology*, 98, 245-251. (seminal reference)

Sleath, B., Carpenter, D.M., Ayala, G.X., Williams, D., Davis, S., ... Gillette, C. (2012). Communication during pediatric asthma visits and child asthma medication device technique 1 month later. *Journal of asthma*, 49(9), 918-927. doi: 10.3109/02770903.2012.719250

Turkeli, A., Yilmaz, O., & Yuksel, H. (2015). Metered dose inhaler-spacer use education effects on achieve asthma control in children. *Tuberk Toraks*, 64(2), 105-111. doi: 10.5578/tt.9142

Walia, M., Paul, L., Satyavani, A., Lodha, R., Kalaivani, M., & Kabra, S.K. (2006). Assessment of inhalation techniques and determinants of incorrect performance among children with asthma. *Pediatric pulmonology*, 41, 1082-1087. doi: 10.1002/ppul.20498 (seminal reference)

Zivkovic, Z., Radic, S., Cerovic, S. & Vukasinovic, Z. (2008). Asthma school program in children and their parents. *World journal of pediatrics*, 4(4) 267-273. (seminal reference)

### **Content Outline:**

- Background and Significance
  - Statistics of pediatric asthma (nation, state, local)
  - Impact of Asthma
  - Symptom Management
  - Asthma Control
  - Asthma Medications
  - Inhaled Medication Usage
  - Rate of Medications Used Correctly in the Literature
  - PICOT: Therefore, the question arises, in pediatric patients with asthma, how does the addition of hands-on inhaler education compared to verbal only inhaler education affect inhaler technique, appropriate utilization of medications, asthma exacerbation visits, ER utilization, school attendance, and parent work attendance over a 3 month period of time?
- Literature Search, Evidence Synthesis
  - Search criteria
  - Evidence Review
- Implementation Plan for Pediatric Practice
  - All asthma patients receive both hands on and verbal inhaler technique education with return demonstration by patient
  - Asthma Control Test (ACT) at each visit
  - Pediatric Asthma Quality of Life at each visit
  - Review of ER utilization, urgent care visits, missed school/work days at each visit

- Outcomes noted at Clinic
  - All patients improved inhaler technique by at least 1 step, as noted in the literature
  - Only 34% of patients received improved asthmatic care program during 3 months. Clinic providers now starting care program after seeing initial outcomes
  - Further metrics to be measured on ongoing basis
  - Initiation of Asthma Medical Home is now underway at clinic for all Asthmatic Patients

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**Author Summary:** Gina Nickels-Nelson is a family nurse practitioner for 15 years. She works with asthmatic patients experiencing repeated exacerbations and hospitalizations. She is a DNP candidate at The University of Texas at Tyler. She focused her EBP scholarly project on improved pediatric asthma outcomes through teaching the family correct use their inhalers. She strives for her patients to learn how to own their health; rather than remain in a state of illness