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Combining pharmacy expertise with asthma educator certification: Assessing the impact on inner-city asthma patients

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Abstract

Objective: Asthma is one of the major causes of hospital readmissions in the South Bronx. The goal of this study was to assess the impact of asthma education provided by registered pharmacists with asthma educator certification (AE-C), on medication adherence and hospitalizations/ Emergency Department (ED) visits.

Methods: This was a retrospective chart review of patients seen in the pulmonary clinic from October 2014 to August 2015 for asthma education by AE-C pharmacists. Medical records were reviewed over an 18-month period -- 9 months before and after the initial asthma education session. Data obtained included adherence to asthma controller inhalers based on pharmacy refill claims, asthma control using asthma control test (ACT) scores and asthma-related hospitalizations or ED visits within 30 days of asthma education. Pre-education data served as

the pre-intervention group data and post-education data served as the post-intervention group data, allowing each patient to serve as their own control.

Results: We found a statistically significant improvement in average medication adherence, i.e. asthma controller inhaler fills at pharmacy (46.3% vs 67.9%, $p\text{-value} < 0.001$) and asthma control (15.71% vs 56.38%, $p\text{-value} < 0.001$) between the pre-intervention and the post-intervention groups. Additionally, a lower hospitalization/ED utilization rate (31.2% vs 6.38%, $p\text{-value} < 0.001$) was observed in the post-intervention group within 30 days of education.

Conclusion: Asthma education provided by AE-C pharmacists had a positive impact on asthma care in our inner-city community. Improving medication adherence and asthma control as well as decreasing hospital utilization could potentially decrease health care costs in addition to improving quality of life.

Declaration of Interest

Authors and members of research team have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter.

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Introduction

Asthma is a chronic lung disease characterized by repeated episodes of wheezing, breathlessness, chest tightness, and coughing, and affecting people of all ages.¹ According to the most recent data from the United States Centers for Disease Control and Prevention (CDC), asthma affects about 24.6 million people in the US and carries a significant health and economic burden to patients, families, and society. In New York City, the borough most affected by asthma is the Bronx, the South Bronx in particular. Asthma affects 10.7% of the South Bronx population, a disproportionately high prevalence when compared to the average prevalence of asthma in New York City (10.2%), New York State (10.7%), and nationwide (7.8%).^{2,3} Common characteristics associated with the increased prevalence of asthma in the South Bronx include household aeroallergens, poor housing conditions, psychological stress among parents, and low expectations for asthma control.⁴

In 2013, the most recent year for which data is available, 1.6 million emergency department (ED) visits were due to uncontrolled asthma.³ Medication adherence to controller drug therapy is vital for adequate control of the disease but remains a challenge. Asthma education has been shown to improve asthma control and patient care. Education is key to promote and increase patient's confidence in asthma self-management. Therefore, asthma education that emphasizes medication and adherence, including proper inhaler techniques, adverse effects of medications, trigger identification, and barriers to medication use, is critical during each patient encounter.

Patient's incomplete understanding of asthma or their individualized treatment plans can lead to exacerbations and increased need for emergency care. A collaborative partnership

between medical providers and patients is vital to encourage patients to be active participants in their care.⁵ BronxCare Hospital Center, a 972-bed acute care facility, serving residents of the South and Central Bronx -- one of the poorest communities of the nation -- delivers such integrated care in an outpatient asthma clinic staffed by a multidisciplinary team.

Since 2014, the asthma clinic implemented a new model to improve education of adult patients with asthma to expand beyond what may occur during regular physician visits or inpatient hospitalizations and ED visits. The goal was to improve asthma care and decrease hospital utilization in our community. The Bronx has a high rate of avoidable adult asthma hospitalizations compared with NYC: 508 per 100,000 adults in the Bronx vs. 249 per 100,000 adults in NYC.⁶ Avoidable hospitalizations are characterized as those hospitalizations that can be prevented by high-quality outpatient care.⁶

According to the Center for Health Workforce Studies in December 2011, the majority of certified asthma educators (AE-C) in New York State are registered nurses (37%) - including nurse practitioners - or respiratory therapists (37%); only 7% are pharmacists and less than 3% are physicians.⁷ At BronxCare, the multidisciplinary team caring for asthma patients attending the pulmonary clinic is composed of a pharmacist who works as both an AE-C and a point of reference for medication-related issues, a respiratory therapist who performs on-site spirometry and FeNO, and a physician. Based on physician's clinical assessment after the pulmonologist visit, which typically occurs first, patients are referred to the AE-C pharmacist for asthma education. The education provided by the AE-C pharmacist, including asthma pathophysiology, proper inhaler technique, and trigger identification and avoidance, is

consistent with the standardized curriculum for asthma self-management education described by Gardner et al.⁸

The rationale to incorporate pharmacy expertise with asthma educator certification was based on the premise that patients will be better educated about asthma medications and gain an increased understanding of their disease. The role of the AE-C pharmacist includes assessing for duplicate therapy, adverse drug events, drug-drug interactions, accuracy of medication regimens, and ensuring patient access to asthma inhalers by reviewing health insurance plan formularies or contacting patients' preferred pharmacies as needed. During every education session, the AE-C pharmacist provides asthma action plans and reviews with patients how to step up their rescue therapy at home during an exacerbation, prior to going to the ED. Asthma action plans are developed based on both the notes and medications prescribed during the pulmonology clinic visit as well as the asthma triggers identified and trigger avoidance methods discussed during the AE-C clinic visit. The objective of this study was to assess the impact of asthma education provided by registered pharmacists, who were additionally certified as asthma educators (AEC), on medication adherence and hospitalizations/ED visits.

Methods

At BronxCare's pulmonary clinic, the AE-C pharmacist follows a standardized system (BronxCare Hospital Center asthma booklet) for education during one-on-one sessions which typically include a review of basic asthma, pathophysiology, symptoms and triggers of asthma, proper medication use (i.e. rescue vs. controller inhalers) and adherence, inhaler techniques, and self-management with the use of peak flow meters, asthma action plans, demonstration

inhalers, and other tools. The clinic is primarily staffed by one post graduate year 2 ambulatory pharmacy resident, 4-6 hours per day, four days per week. During our study period, BronxCare's pulmonary clinic also had three other AE-C pharmacists that would rotate in the clinic on an as needed basis. The pharmacists all had a PharmD degree, had completed a minimum of one year of post graduate training at an accredited residency program, and had a minimum of one year of clinical experience. For billing purposes, each visit was allotted 30 minutes, which would allow the AE-C pharmacist to educate a maximum of 8-10 patients per clinic session. Clinic visits often took longer than 30 minutes, however, particularly if telephone language interpreter services were required or if there were concerns regarding patient comprehension; and the number of clinic visitors varied on a daily basis.

Subjective assessments of asthma control, using the Asthma Control Test (ACT), are performed during every clinic visit. The ACT is a five-item self-administered questionnaire about frequency of asthma symptoms, regularity of inhaler use, and perceived level of asthma control during the prior four weeks.⁹ Responses to each question are associated with scores of 1-5 with higher scores (>19) indicating increased asthma control. Patient visits to the AE-C are limited to a comprehensive, single session to minimize the financial burden on the patient and improve compliance to visits. Asthma education sessions are held in the asthma educator's office which is located on the same floor as pulmonary clinics.

A retrospective chart review of all adult patients with asthma seen by the AE-C pharmacist in the pulmonary clinic from October 2014 to August 2015 was conducted (Figure 1). The study was approved by the hospital Institutional Review Board. Patient charts were

examined for evidence of adherence to all asthma controller inhalers (such as inhaled corticosteroid [ICS], combination medications (ICS + long-acting beta2-agonist [LABA]), and long-acting muscarinic antagonists [LAMA]) as indicated by regular prescription refills, and ACT scores in the 9-month period before and after their initial asthma education session. Data regarding demographics, asthma-related hospitalizations or ED visits 30 days before and after asthma education was obtained. Study data was collected from the hospital's electronic health system (EHS) records and through phone calls to patients' community pharmacies.

Patients were included in the study if they had a visit with a pulmonologist, had a diagnosis of persistent asthma (ICD 9 code 493.xx) and received education between October 1st, 2014 and August 31st, 2015 by an AE-C pharmacist.

Data from visits prior to the initial asthma education session (pre-education group) was compared with data collected post asthma education sessions (post-education group), allowing each patient to serve as their own control. The data collected included the type of asthma controller inhalers prescribed, refill dates, refill patterns from January 2014 to May 2016, adherence rates to asthma controller medications, ACT scores, and ED/hospital admission history. Patients were contacted via phone following their education session to determine their post-education ACT score if it was not documented at their next pulmonary clinic follow-up visit. Patients' pharmacies were contacted to get up-to-date information on medication refills if the information was not available via an internal source of medication fill verification. A refill was considered late if the patient did not fill the medication within a week after the expected refill date.

The primary endpoint of the study was change in adherence rate to asthma controller medications. Secondary endpoints were asthma-related ED/hospital admissions within 30 days of asthma education and number of patients with well-controlled asthma, defined as having an ACT score ≥ 20 . Medication adherence was calculated by reviewing the refill history of the patients, i.e., dividing the number of months the prescribed controller inhaler was picked up by patients during the study period (nine months of pre- and post-intervention periods) by the number of expected refills and converting it into a percentage. There was no defined set point for optimal adherence rate since the study focus was to increase current adherence rate through asthma education.

Statistical Analysis

A t-test was performed to determine if education provided by an AE-C pharmacist had any impact on asthma controller medications adherence rates.¹⁰ A chi square test was performed to determine whether asthma education impacted the number of patients with controlled asthma (ACT ≥ 20), and 30-day hospital/ED admissions.¹¹ The impact was considered significant if the p-value was less than 0.05.

Results

A total of 141 patients were included in the study out of 182 patients who were referred for asthma education. The remaining 41 patients were excluded because education was performed by a non-pharmacist. The majority of patients were female (75%) and identified as being of a minority race – i.e. African/Black, Spanish/Latino, or Puerto Rican (58%) (Table 1). Eighty pharmacies were contacted during the study period to retrieve medication refill

information. Specific inhaler brand/generic names of controller inhalers were not collected during pharmacy refill data collection. There was a statistically significant difference in average medication adherence rates for asthma controller inhalers in the post education versus the pre education group (67.9% vs. 46.3%, $p < 0.0001$). ACT scores were available for 98 (70%) patients with the remaining patients lost for follow up. Asthma control, as evidenced by the ACT score ≥ 20 , was significantly higher in the post education group compared with the pre education group (56.4% vs. 15.7%, $p < 0.0001$). Also, hospital admission /ED visit rates within 30 days of education was lower: 6.4% in the post education group compared with 31.2% ($p < 0.0001$) in the pre education group (Table 2).

During the study period, all of the patients except two received only one asthma education session. Thus, we were unable to evaluate the impact of multiple education sessions on medication adherence rates, ACT scores, or ED visits/hospital admissions

Discussion

Research shows that pharmacists are in a more ideal position than other healthcare professionals to teach proper administration techniques for various drug delivery systems, including inhaler devices, because it is an essential part of the doctor of pharmacy curriculum.¹² Pharmacists' knowledge of adverse medication reactions and mechanisms of action also puts them in a unique position to analyze information gained during the asthma education session and take action to make necessary therapy recommendations.

A 2014 survey of AE-C pharmacists in the US revealed a number of perceived benefits among this group when compared with non AE-C pharmacists, including: professional

advancement, improved confidence in managing asthma, and increased credibility among colleagues.¹² However, limited recognition of the credential among pharmacists and lack of reimbursement for services are some of the barriers to pursuing an AE-C.¹² There is limited data regarding the impact of asthma education provided by AE-C pharmacists.

Our findings suggest that asthma education provided by a pharmacist who is a certified asthma educator may improve asthma care among patients attending a pulmonary clinic in an inner-city community. This was supported by the findings of increased medication adherence to asthma controller inhalers, improved asthma control as per ACT scores, and decreased hospital utilization.

Adequate patient education is vital to achieve asthma control.⁶ Our results suggest that a pharmacist with the AE-C credential is an ideal candidate to provide asthma education with a greater focus on medication use and to assist patients with overcoming barriers to medication adherence. In our study, the AE-C pharmacist also took an extra step after identifying the non-adherent patients -- pharmacies were contacted, patients were called and reminded of their appointments and offered additional education sessions. Based on our experiences calling community pharmacies and interviewing patients during and after AE-C clinic visits some of the most important barriers to medication adherence included: no health insurance coverage or changing coverage for inhalers, poor adherence to physician and/or asthma education appointments, late refill of medications, and poor self-management skills. Poor self-management skills were a result of patients' lack of knowledge and understanding regarding their disease state and medications (rescue vs. controller inhaler usage).

We infer from our results that the combined effect of pharmacist-provided asthma education in collaboration with same-day physician visits contributed to increased medication adherence. Increased adherence led to better controlled asthma based on ACT score comparisons. We also believe that the asthma education intervention was integral to the nearly 25% decrease in hospital utilization. Education provides patients with tools to empower themselves to self-manage asthma, which may potentially lead to fewer ED visits and hospital admissions in high-risk individuals.⁶ The landmark Asheville Project documented the cost effectiveness of education provided by asthma education certificate trained pharmacists for patients with asthma. Bunting and Cranor concluded patients with asthma who received education and long-term medication therapy management services provided by 18 certificate trained pharmacists achieved and maintained significant improvements and had significantly decreased overall asthma-related costs despite increased medication costs that resulted from increased use. The study resulted in an average estimated direct cost savings of \$725/patient/year and an average estimated indirect cost savings of \$1230/patient/year.¹³ Our study showed similar results with decreased admissions at 30 days and improved subjective measures of asthma control.

Our study and its findings were instrumental in the creation of a collaborative drug therapy management (CDTM) agreement and protocol with the pulmonary division. This agreement allows the function of AE-C pharmacists in our pulmonary clinic to extend beyond patient education and into medication management, i.e., making dose adjustments based on asthma control and providing refills. Ideally, the CDTM agreement will allow pulmonologists to

spend more time with new and complex patients while allowing pharmacists to manage uncomplicated patients referred by pulmonologists.

Continued follow up with non-adherent patients is necessary to ensure their timely refilling of asthma medication(s). According to Brown et al. having asthma education delivered by community pharmacies may also increase patient engagement and ultimately lead to better asthma control.¹⁴ Involving community pharmacists in our effort to promote timely prescription refills and reinforce education provided in our clinic by AE-C pharmacists also played a role in increasing adherence and asthma control.

One of the major strengths of our study is that we eliminated patients' variability regarding environmental and personal characteristics since we used the same patient as control and intervention. A limitation of the study includes patients being referred to the AE-C pharmacist for education at the physician's discretion based on their clinical assessment alone without any universal criteria. This could have led to selection bias by having more patients with severe asthma and/or non-adherence referred to the AE-C pharmacist. However, as patients served as their own control, we believe this limitation is relative. Other limitations of this study include: a) reliance on medication refill patterns as an indicator of medication adherence, b) inability to capture data regarding ED/inpatient admissions at hospitals outside the BronxCare Health System network, c) lack of data on specific inhaler brand/generic names of controller inhalers, d) single center experience, and e) no data available regarding asthma control in 30% of patients.

Conclusion

In an inner city hospital, the addition of an AE-C pharmacist was associated with improved medication adherence, increased asthma control and decreased hospital utilization. This model enabled patients to be seen on the same day by the physician and asthma educator, thus allowing for the clarification of any health insurance coverage issues and potentially decreasing the no-show rate to future follow-up education sessions that would have otherwise been scheduled. This is attractive to patients with limited resources or busy schedules who are not able to return to clinic. This study demonstrates a unique opportunity for pharmacists to improve asthma control and patient outcomes through both initial face-to-face education about asthma and its medications and later follow up through a phone call if needed. We suggest that incorporation of a pharmacist trained in asthma education to the team caring for patients with asthma could potentially be a cost effective model, especially in financially challenged areas.

To further enhance educational services under BronxCare's existing structure, group asthma education classes have been implemented at the pulmonary clinic and education is provided over multiple sessions. Future research should evaluate the impact of these group asthma education sessions on attendees' self-perceived asthma control and hospital admissions/ED visits. We expect that these group sessions in combination with one-on-one visits will help reduce asthma exacerbations as well as asthma-related hospitalizations and ED visits, thereby ensuring that we meet the objectives set forth in the Healthy People 2020 goal for promoting respiratory health.¹⁵

References

1. Expert panel report 3: guidelines for the diagnosis and management of asthma. Bethesda MD: National Institutes of Health, National Asthma Education and Prevention Program; 2007 [cited 2018 Jan 4]. NIH Publication No. 08-4051. Available at: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>.
2. New York State asthma surveillance summary report. Health New York State Department of Health; October 2013 [cited 2018 Jan 4]. Available at: https://www.health.ny.gov/statistics/ny_asthma/pdf/2013_asthma_surveillance_summary_report.pdf
3. 2015 National Health Interview Survey (NHIS) Data. Centers for Disease Control and Prevention (CDC) [cited 2018 Jan 4]. Available at: http://www.cdc.gov/asthma/most_recent_data.htm
4. Warman K, Silver EJ, Wood PR. Modifiable risk factors for asthma morbidity in Bronx versus other inner-city children. *J Asthma*. 2009 Dec; 46(10): 995–1000.
5. Maridee A J. Asthma self-management patient education. *Respiratory Care*. June 2004; 53(6):778-86. Available at: <http://www.rcjournal.com/contents/06.08/06.08.0778.pdf>.
6. King L, Hinterland K, Dragan KL, et al. Community health profiles 2015, Bronx community district 5: Fordham and University Heights; 2015; 17(59):1-16.
7. The certified asthma educator workforce in New York. Center for Health Workforce Studies. December 2011 [cited 2018 Jan 4]. Available at: http://www.chwsny.org/wp-content/uploads/2011/12/asthmaed2011_Final_reduced.pdf
8. Gardner A, Kaplan B, Brown W, et al. National standards for asthma self-management education. *Ann of Allergy, Asthma & Immunology*. 2015 Mar; 114(3): 178–186.
9. Asthma Control Test. Available at: https://www.asthma.com/content/dam/NA_Pharma/Country/US/Unbranded/Consumer/Common/Images/MPY/documents/816207R0_asthmacontroltest_printable.pdf
10. GraphPad QuickCalcs: t test calculator. Available at: <https://www.graphpad.com/quickcalcs/ttest1.cfm>
11. GraphPad QuickCalcs: chi square calculator. Available at: <https://www.graphpad.com/quickcalcs/chisquared1.cfm>
12. Hudd TR, Bollmeier SG, Seoane-Vazquez E. Survey of Certified Asthma Educator (AE-C) pharmacists – Who are they and how is this credential being used? *J Pulm Respir Med*. 2014 4:223. Available at: <http://www.omicsonline.org/open-access/survey-of-certified-asthma-educator-aec-pharmacists-who-are-they-and-how-is-this-credential-being-used-2161-105X.1000223.pdf>
13. Bunting B, Cranor C. The asheville project: long-term clinical, humanistic, and economic outcomes of a community-based medication therapy management program for asthma. *J Am Pharm Assoc* 2006;46:133–147

14. Brown W, Scott D, Friesner D, Schmitz T. Impact of telepharmacy services as a way to increase access to asthma care. *J Asthma*. 2017 Jan 17:1-7.
15. Healthy People 2020. US Department of Health and Human Services - Office of Disease Prevention and Health Promotion. Washington, DC [cited 2018 Jan 4]. Available at: <https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives>.

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Table 1: Demographic Characteristics

Variable		n (%)
Gender	Male	35 (24.8)
	Female	106 (75.2)
Ethnicity	African American	41 (29.1)
	Hispanic	37 (26.2)
	Puerto Rican	4 (2.8)
	Other	56 (39.7)
	Unknown	3 (2.1)

Table 2: Outcomes Measures

	Pre Asthma Education (%)	Post Asthma Education (%)	p-value
Average Medication Adherence Rate	46.3%	67.9%	< 0.0001
ACT $\geq$ 20	22/140 (15.7)	53/98 (56.4)	< 0.0001
Admission 30 days before and after education	44/141 (31.2)	9/141 (6.4)	< 0.0001

Figure 1: Study design

