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# Providing Asthma Management in the Retail Clinic Setting

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## Abstract

**Objective**: To determine whether there are differences in asthma management provided in the retail clinic setting versus in the primary care setting, and whether it would increase the number of well controlled asthmatics as determined by ACT score of 20 or greater, and less than or equal to 1 ED or hospital visit due to asthma, within 6 months. **Methods:** All asthma patients with an asthma control test (ACT) of 19 or less, received a new or updated asthma action plan (AAP) at the visit. If the patient presented to the retail clinic during an asthma exacerbation or with any asthma symptoms, they were not given an ACT and received usual care. Asthma quality data was retrospectively collected for primary care patients seen in the 6-months prior to as well as up to 6 months after the patient's enrollment visit. **Results:** There was no significant difference in the number of admissions between locations in either the pre-implementation period or the post-implementation period for either the pediatric or adult cohort. There was a significant improvement in the percentage of pediatric and adult patients with at least 1 ACT in the post-implementation compared to pre-implementation for both retail clinic and primary care sites. The percentage of pediatric and adult patients with at least 1 AAP increased in the post-implementation compared to pre-implementation for both retail clinic and primary care sites. **Conclusion:** Retail clinics may be able to provide asthma management with similar outcomes to primary care settings.

## Keywords

asthma, retail clinic, asthma control test, asthma action plan, emergency department visits, hospitalization

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## Introduction

Asthma is a chronic, inflammatory disease that continues to prove challenging to control and can result in poor outcomes and high costs. According to the Centers for Disease Control and Prevention (CDC), in 2019, almost 25 million people or 7.8% of the United States population had asthma. In 2018, there were over 178 000 hospitalizations, and 1.6 million emergency department (ED) visits with asthma as the primary diagnosis. Asthma was reported to have caused 3524 deaths in the US in 2019. Of these deaths, 178 were in children under age 18, and 3346 were in adults.[1]

Healthy People 2020 objectives include increasing the number of patients with asthma who receive a written asthma action plan, and to decrease ED visits, hospitalizations, and deaths associated with asthma.[2] Focused updates were made to the national asthma guidelines in 2020 but they continue to recommend obtaining asthma control test (ACT) scores on all asthma patients at each visit to a medical provider when not experiencing an exacerbation. Likewise, an asthma action plan (AAP) should be updated and discussed with the patient annually.[3]

An ACT is a patient-reported assessment of their asthma symptoms and is used to monitor the effectiveness of treatment management and support treatment decisions.[4] The ACT utilizes 5 questions and asks patients to recall their asthma symptoms (daytime and nocturnal), the use of rescue medications, the effect of asthma on daily functioning, and the patient's perception of asthma control over the previous 4 weeks. A score of $\geq 20$ indicates asthma is well controlled and $<20$ is not well controlled.[5] Both observational and randomized, controlled studies have supported the content validity of the ACT as a measure of asthma control.[4] Each patient encounter is an opportunity to assess asthma control using this standardized tool.[6]

A literature review of 74 publications found that 69 of these studies found that improvement in ACT score was

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related to improvement in outcomes. Substantial evidence was identified for relationships between ACT score, lung function, and asthma related quality of life. Moderate evidence was identified for ACT score and rescue medication use, exacerbations, sleep quality, work, and productivity. Findings suggested that the ACT is an appropriate measure for overall asthma impact and support its use in clinical settings.[7] It is also shown to be an effective part of the routine evaluation of asthmatic children[8] and allows better assessment of asthma control and adaptation of treatment.[9]

The AAP is the foundation of managing asthma.[10] A written action plan provides the patient with instructions on which medications to take, when to take them, and when to seek medical care. AAPs support patients in self-management of chronic disease, in promoting shared decision making between patient and provider, and in improving communication between providers, patients, schools, and other caretakers. The AAP is effective in providing patients real time asthma exacerbation self-management to achieve and sustain better asthma control.[11] In examining national trends, the percentage of US children with asthma that had ever received an asthma action plan increased between 2002 and 2013, but results indicated that even with the increase, 50% of children still had never received an AAP in 2013.[12] A 2017 study involving a Midwest community clinic demonstrated only 44% of adult patients had an AAP.[13]

A Cochrane review of 36 studies showed significant reductions in ED visits, hospitalizations, unscheduled visits to the doctor, days off work or school, nocturnal asthma, and improved quality of life in patients that had an AAP as part of self-management when compared to usual care.[14] A systematic review of randomized controlled trials showed written action plan use significantly reduced acute care visits, missed school days, nocturnal awakening, and improved symptom scores in children.[15] A randomized controlled trial showed those patients who received AAPs experienced more green zone days and had earlier asthma exacerbation self-management concomitant with fewer ED visits, hospitalization, and absenteeism.[11] Delivery of a written action plan also increased patient adherence to inhaled and oral corticosteroids, improved asthma control, and medical follow-up, which supports its use in the acute care setting.[16]

Despite the national guideline recommendations, provider compliance has been low with using these tools. This may partially be due to the complexity and length of the guideline. Other barriers include lack of time, inexperience, and insufficient confidence in making appropriate recommendations, as well as the perception that the patient may be unable to self-manage or not able to adhere to the plan.[17]

Many asthma patients seek care in the retail clinic setting rather than in primary care, due to convenience and cost of care. Retail clinics have demonstrated success in managing a variety of acute illness and conditions, taking some of the burden off primary care providers and often at a decreased cost.[18] In the past, chronic disease management has been considered out of the scope of practice for retail clinic providers. Recently, there has been a trend to expand services resulting in retail clinics beginning to manage chronic health conditions. Unfortunately, there are currently no studies examining whether retail clinics can effectively manage asthma patients, and decrease ED visits and hospitalizations, potentially saving a significant amount of money and burden on our health care system. Retail clinics could potentially play a huge role in keeping patients with asthma out of the emergency room. In examining asthma patients who visited the ED, the majority reported not receiving education about asthma and/or were using medication improperly.[19] This is something that can and should be done with each asthma visit and could be done in the retail setting.

In this study, we wanted to determine whether providing asthma management in the retail clinic setting would be as effective as care provided in the primary care setting and whether it would increase the number of well controlled asthmatics as determined by ACT score of 20 or greater. and less than or equal to 1 ED or hospital visit due to asthma, within the calendar year.

## Methods

Institutional review board (IRB) approval was obtained at our medical center for enrollment of patients into the study. The retail clinic nurse practitioners were each given updated education on the stepwise approach to chronic asthma management and asthma exacerbation. Communication was sent to all primary care clinicians to make them aware that all providers within the retail clinics would be collecting ACTs, completing AAPs, and assisting in asthma management utilizing the stepwise approach established by the national guidelines.

Primary care asthma patients that presented to 1 of our 3 retail clinics were asked during their visit if they would like to participate in the study. Verbal informed consent or assent and written HIPAA documentation was adequate for this study as it was considered to be low risk. Once consent or assent was obtained, the ACT was completed and entered into the patient's chart.

Any patient with an ACT of 19 or less received a new or updated AAP at the visit. Communication was sent to the ECH primary providers to follow up on ACTs that were out of range. If the patient presented to the retail clinic during an asthma exacerbation or with any asthma symptoms, they were not given an ACT and received usual care (ie, stepwise based approach to care which included beta agonists, inhaled corticosteroids, oral steroids, or other medication as appropriate). If there was no AAP in the electronic medical record (EMR), for the patient in an acute exacerbation, then

one was provided. Data was analyzed for change in quality measurement scores, number of completed ACTs and AAPs, and the medications prescribed for the asthma exacerbation.

Asthma quality data was retrospectively collected for primary care patients in the 6-months prior to as well as up to 6 months after the patient's enrollment visit. The data included the number of patients aged 5 to 50 and assessed whether those patients had a well-controlled ACT, an annual AAP completed, and the number of asthma related ED visits or hospitalizations.

Data was summarized using frequencies and percentages for categorical data, and either means and standard deviations or medians and interquartile ranges for continuous data. Asthma patients seen in the retail clinics were matched 1:1 to asthma patients seen in other primary care clinics in the same healthcare system, based on gender and age ($\pm 5$ years, pediatrics were matched to pediatrics and adults were matched to adults). Due to our cohort being largely white, we chose not to include race in our matching criteria as it could further limit the number of non-white patients that ended up in the analysis cohort. Given that all patients came from a single medical center, there was not a large variability in zip-codes so that was also not used in our matching criteria.

Wilcoxon rank sum tests were used to compare quality measurement scores, the number of completed ACTs, and the number of AAPs before and after implementation of this new practice between locations along with the changes between the pre and post periods. Categorical data was compared between locations and between the pre and post periods using either a Chi-square or Fisher's exact test. All tests were 2-sided, and $P$-values $\leq .05$ were considered statistically significant. All analyses were performed using SAS version 9.4 software (SAS Institute Inc., Cary, NC).

## Setting

The study was carried out at the 3 metropolitan Minnesota retail clinics all within the same medical system.

## Participants

About 762 subjects with asthma were included in this study, 381 seen in the retail clinic setting and 381 control subjects from primary care. The patients seen in the retail clinic setting were accrued between August 1, 2019, and March 10, 2020. Forty declined and 1 withdrew from the study. The following inclusion and exclusion criteria were used for enrollment of participants in the study:

Inclusion criteria:

- Patients who verbally consent/assent to complete an ACT at each visit at the retail clinic and allow a chart review for data collection.
- Patients who have given research authorization for retrospective chart review.

Exclusion criteria:

- Patients with history of asthma diagnosis that has been resolved.
- Patients at the retail clinic who do not consent/assent to complete the ACT or chart review and/or who have not given research authorization.

## Results

The analysis was stratified by pediatric and adult populations.

There were a low number of admissions overall, only 0.5% of patients in the 6 months pre-implementation and 0% in the 6 months post-implementation had a hospitalization. There was no significant difference in the number admissions between locations in the post-implementation period ($P > .99$) (Table 1).

In the 6 months pre-implementation, 45.2% of MCEC patients had an ACT compared to 34.6% at other locations ($P = .16$). In the 6 months post-implementation, there was no statistically significant difference between locations, with 63.5% of MCEC patients having an ACT compared to 69.2% at other locations ($P = .46$). There was a significant improvement in the percent of patients with at least 1 ACT in the post-implementation compared to pre-implementation for both MCEC and other sites ($P < .001$) (Table 1).

Among those with an ACT, there was no significant difference between locations in terms of the percentage of patients with their most recent ACT in control in the pre-implementation period (89.4% vs 86.1%, $P = .65$) or the post-implementation period (84.8% vs 84.7%, $P = .98$) (Table 1).

In the 6 months pre-implementation, 38.5% of MCEC patients had an AAP compared to 27.9% at other locations ($P = .14$). In the 6 months post-implementation, 47.1% of MCEC patients had an AAP compared to 47.1% at other locations ($P > .99$). There was a significant improvement in the percent of patients with at least 1 AAP in the post-implementation compared to pre-implementation for both MCEC and other sites ($P = .004$) (Table 1).

There were no admissions in either the 6 months pre-implementation or the 6 months post-implementation period. In the 6 months pre-implementation, 35.7% of MCEC patients had an ACT compared to 20.6% at other locations ($P < .001$). In the 6 months post-implementation, there was no statistically significant difference between locations, with 59.9% of MCEC patients having an ACT compared to 55.6% at other locations ($P = .34$). There was a significant improvement in the percent of patients with at least 1 ACT in the post-implementation compared to pre-implementation for both MCEC and other sites ($P < .001$) (Table 2).

**Table 1.** Characteristics of Pediatric Sample.

| | MCEC (N = 104) | Other (N = 104) | Total (N = 208) | *P* value |
|---|---|---|---|---|
| Age, mean (SD) | 11.5 (3.6) | 11.5 (3.6) | 11.5 (3.6) | |
| Gender | | | | |
| F | 38 (36.5%) | 38 (36.5%) | 76 (36.5%) | |
| M | 66 (63.5%) | 66 (63.5%) | 132 (63.5%) | |
| Race name | | | | .36 |
| White | 79 (76.0%) | 75 (72.1%) | 154 (74.0%) | |
| American Indian/Alaskan Native | 1 (1.0%) | 0 (0.0%) | 1 (0.5%) | |
| Asian | 5 (4.8%) | 6 (5.8%) | 11 (5.3%) | |
| Black or African American | 9 (8.7%) | 11 (10.6%) | 20 (9.6%) | |
| Other | 7 (6.7%) | 12 (11.5%) | 19 (9.1%) | |
| Unknown/choose not to disclose | 3 (2.9%) | 0 (0.0%) | 3 (1.4%) | |
| Ethnicity name | | | | .005 |
| Not Hispanic or Latino | 94 (90.4%) | 103 (99.0%) | 197 (94.7%) | |
| Hispanic or Latino | 7 (6.7%) | 0 (0.0%) | 7 (3.4%) | |
| Unable to provide/choose not to disclose | 3 (2.9%) | 1 (1.0%) | 4 (1.9%) | |
| Number of Admissions in 6 months prior, Median (Range) | 0 (0-1) | 0 (0-0) | 0 (0-1) | >.99 |
| 0 | 103 (99.0%) | 104 (100%) | 207 (99.5%) | |
| 1 | 1 (1.0%) | 0 (0.0%) | 1 (0.5%) | |
| Number of admissions in 6 months post, Median (Range) | 0 (0-0) | 0 (0-0) | 0 (0-0) | >.99 |
| 0 | 104 (100%) | 104 (100%) | 208 (100%) | |
| Number of ACTs in 6 months prior, Median (IQR) | 0 (0, 1) | 0 (0, 1) | 0 (0, 1) | .12 |
| Range | (0-2) | (0-3) | (0-3) | |
| 0 | 57 (54.8%) | 68 (65.4%) | 125 (60.1%) | |
| 1 | 41 (39.4%) | 32 (30.8%) | 73 (35.1%) | |
| 2 | 6 (5.8%) | 3 (2.9%) | 9 (4.3%) | |
| 3 | 0 (0.0%) | 1 (1.0%) | 1 (0.5%) | |
| Most recent ACT in 6 months prior | | | | .88 |
| N | 47 | 36 | 83 | |
| Median (IQR) | 24 (21, 25) | 24 (21, 25) | 24 (21, 25) | |
| Range | (16-27) | (15-27) | (15-27) | |
| Most recent ACT in 6 months prior in control? | | | | .65 |
| N/A (no ACT in 6 months prior) | 57 | 68 | 125 | |
| No | 5 (10.6%) | 5 (13.9%) | 10 (12.0%) | |
| Yes | 42 (89.4%) | 31 (86.1%) | 73 (88.0%) | |
| Number of ACTs in 6 months post, Median (IQR) | 1 (0, 1) | 1 (0, 1) | 1 (0, 1) | .29 |
| Range | (0-3) | (0-5) | (0-5) | |
| 0 | 38 (36.5%) | 32 (30.8%) | 70 (33.7%) | |
| 1 | 47 (45.2%) | 48 (46.2%) | 95 (45.7%) | |
| 2 | 13 (12.5%) | 17 (16.3%) | 30 (14.4%) | |
| 3 | 6 (5.8%) | 2 (1.9%) | 8 (3.8%) | |
| 4 | 0 (0.0%) | 4 (3.8%) | 4 (1.9%) | |
| 5 | 0 (0.0%) | 1 (1.0%) | 1 (0.5%) | |
| Most recent ACT in 6 months post | | | | .65 |
| N | 66 | 72 | 138 | |
| Median (IQR) | 23 (22, 24) | 24 (21, 25) | 23 (21, 25) | |
| Range | (15.0-27.0) | (10.0-27.0) | (10.0-27.0) | |

*(continued)*

**Table 1. (continued)**

| | MCEC (N = 104) | Other (N = 104) | Total (N = 208) | *P* value |
|---|---|---|---|---|
| Most recent ACT in 6 months post in control? | | | | .98 |
| N/A (no ACT in 6 months post) | 38 | 32 | 70 | |
| No | 10 (15.2%) | 11 (15.3%) | 21 (15.2%) | |
| Yes | 56 (84.8%) | 61 (84.7%) | 117 (84.8%) | |
| Number of AAPs in 6 months prior, Median (IQR) | 0 (0, 1) | 0 (0, 1) | 0 (0, 1) | .097 |
| Range | (0-3) | (0-2) | (0-3) | |
| 0 | 64 (61.5%) | 75 (72.1%) | 139 (66.8%) | |
| 1 | 36 (34.6%) | 27 (26.0%) | 63 (30.3%) | |
| 2 | 3 (2.9%) | 2 (1.9%) | 5 (2.4%) | |
| 3 | 1 (1.0%) | 0 (0.0%) | 1 (0.5%) | |
| Number of AAPs in 6 months post, Median (IQR) | 0 (0, 1) | 0 (0, 1) | 0 (0, 1) | .70 |
| Range | (0-2) | (0-2) | (0-2) | |
| 0 | 55 (52.9%) | 55 (52.9%) | 110 (52.9%) | |
| 1 | 40 (38.5%) | 46 (44.2%) | 86 (41.3%) | |
| 2 | 9 (8.7%) | 3 (2.9%) | 12 (5.8%) | |

Multivariable Models:

Outcome: Any ACT.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | 1.11 (0.74-1.65) | .61 |
| Time period (Post vs Pre) | 2.97 (1.99-4.43) | <.001 |

*Interaction between time period and location was not significant (*P* = .087).

Outcome: ACT in Control.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | 1.11 (0.52-2.39) | .78 |
| Time Period (Post vs Pre) | 0.77 (0.34-1.73) | .53 |

*Interaction between time period and location was not significant (*P* = .72).

Outcome: Any AAP.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | 1.25 (0.84-1.86) | .27 |
| Time Period (Post vs Pre) | 1.80 (1.21-2.68) | .004 |

*Interaction between time period and location was not significant (*P* = .24).

Among those with an ACT, patients going to MCEC were more likely to have their most recent ACT in control in the pre-implementation period compared to other locations (87.9% vs 61.4%, $P < .001$). There was no significant difference between locations in terms of the percentage of patients with their most recent ACT in control in the post-implementation period (75.3% vs 74.7%, $P = .90$) (Table 2).

In the 6 months pre-implementation, 9% of MCEC patients had an AAP compared to 5.4% at other locations ($P = .14$). In the 6 months post-implementation, 40.4% of MCEC patients had an AAP compared to 27.4% at other locations ($P = .002$). There was a significant improvement in the percent of patients with at least 1 AAP in the post-implementation compared to pre-implementation for both MCEC and other sites ($P = .004$) (Table 2).

**Table 2.** Characteristics of Adult Sample.

| | MCEC (N = 277) | Other (N = 277) | Total (N = 554) | *P* value |
|---|---|---|---|---|
| Age, mean (SD) | 33.6 (8.4) | 33.6 (8.3) | 33.6 (8.3) | |
| Gender | | | | |
| F | 215 (77.6%) | 215 (77.6%) | 430 (77.6%) | |
| M | 62 (22.4%) | 62 (22.4%) | 124 (22.4%) | |
| Race | | | | .086 |
| White | 250 (90.3%) | 236 (85.2%) | 486 (87.7%) | |
| American Indian/Alaskan Native | 1 (0.4%) | 3 (1.1%) | 4 (0.7%) | |
| Asian | 6 (2.2%) | 3 (1.1%) | 9 (1.6%) | |
| Black or African American | 5 (1.8%) | 16 (5.8%) | 21 (3.8%) | |
| Native Hawaii/Pacific Islander | 0 (0.0%) | 1 (0.4%) | 1 (0.2%) | |
| Other | 14 (5.1%) | 15 (5.4%) | 29 (5.2%) | |
| Unknown/choose not to disclose | 1 (0.4%) | 3 (1.1%) | 4 (0.7%) | |
| Ethnicity | | | | .60 |
| Not Hispanic or Latino | 260 (93.9%) | 254 (91.7%) | 514 (92.8%) | |
| Hispanic or Latino | 12 (4.3%) | 17 (6.1%) | 29 (5.2%) | |
| Unknown/choose not to disclose | 5 (1.8%) | 6 (2.2%) | 11 (2.0%) | |
| Number of Admissions in 6 months prior, Median (Range) | 0 (0-0) | 0 (0-0) | 0 (0-0) | >.99 |
| 0 | 277 (100%) | 277 (100%) | 554 (100%) | |
| Number of Admissions in 6 months post, Median (Range) | 0 (0-0) | 0 (0-0) | 0 (0-0) | >.99 |
| 0 | 277 (100%) | 277 (100%) | 554 (100%) | |
| Number of ACTs in 6 months prior, Median (IQR) | 0 (0, 1) | 0 (0, 0) | 0 (0, 1) | <.001 |
| Range | (0-2) | (0-6) | (0-6) | |
| 0 | 178 (64.3%) | 220 (79.4%) | 398 (71.8%) | |
| 1 | 87 (31.4%) | 51 (18.4%) | 138 (24.9%) | |
| 2 | 12 (4.3%) | 4 (1.4%) | 16 (2.9%) | |
| 3 | 0 (0.0%) | 1 (0.4%) | 1 (0.2%) | |
| 6 | 0 (0.0%) | 1 (0.4%) | 1 (0.2%) | |
| Most recent ACT in 6 months prior | | | | .005 |
| N | 99 | 57 | 156 | |
| Median (IQR) | 23 (21, 25) | 21 (16, 24) | 22 (20, 25) | |
| Range | (8-25) | (6-25) | (6-25) | |
| Most recent ACT in 6 months prior in control? | | | | <.001 |
| N/A (no ACT in 6 months prior) | 178 | 220 | 398 | |
| No | 12 (12.1%) | 22 (38.6%) | 34 (21.8%) | |
| Yes | 87 (87.9%) | 35 (61.4%) | 122 (78.2%) | |
| Number of ACTs in 6 months post, Median (IQR) | 1 (0, 1) | 1 (0, 1) | 1 (0, 1) | .43 |
| Range | (0-4) | (0-3) | (0-4) | |
| 0 | 111 (40.1%) | 123 (44.4%) | 234 (42.2%) | |
| 1 | 140 (50.5%) | 126 (45.5%) | 266 (48.0%) | |
| 2 | 24 (8.7%) | 26 (9.4%) | 50 (9.0%) | |
| 3 | 1 (0.4%) | 2 (0.7%) | 3 (0.5%) | |
| 4 | 1 (0.4%) | 0 (0.0%) | 1 (0.2%) | |
| Most recent ACT in 6 months post | | | | .72 |
| N | 166 | 154 | 320 | |
| Median (IQR) | 23 (20, 25) | 22 (19, 25) | 23 (20, 25) | |
| Range | (5-25) | (5-25) | (5-25) | |
| Most recent ACT in 6 months post in control? | | | | .90 |
| N/A (no ACT in 6 months post) | 111 | 123 | 234 | |
| No | 41 (24.7%) | 39 (25.3%) | 80 (25.0%) | |
| Yes | 125 (75.3%) | 115 (74.7%) | 240 (75.0%) | |

*(continued)*

**Table 2. (continued)**

| | MCEC (N = 277) | Other (N = 277) | Total (N = 554) | *P* value |
|---|---|---|---|---|
| Number of AAPs in 6 months prior, Median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | .10 |
| Range | (0-1) | (0-2) | (0-2) | |
| 0 | 252 (91.0%) | 262 (94.6%) | 514 (92.8%) | |
| 1 | 25 (9.0%) | 14 (5.1%) | 39 (7.0%) | |
| 2 | 0 (0.0%) | 1 (0.4%) | 1 (0.2%) | |
| Number of AAPs in 6 months post, Median (IQR) | 0 (0, 1) | 0 (0, 1) | 0 (0, 1) | .002 |
| Range | (0-3) | (0-2) | (0-3) | |
| 0 | 165 (59.6%) | 201 (72.6%) | 366 (66.1%) | |
| 1 | 104 (37.5%) | 69 (24.9%) | 173 (31.2%) | |
| 2 | 7 (2.5%) | 7 (2.5%) | 14 (2.5%) | |
| 3 | 1 (0.4%) | 0 (0.0%) | 1 (0.2%) | |

Multivariable Models:

Outcome: Any ACT.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | | |
| Other-Pre | Reference | |
| MCEC-Pre | 2.15 (1.47-3.14) | .018 |
| Other-Post | 4.83 (3.32-7.04) | <.001 |
| MCEC-Post | 5.77 (3.96-8.42) | <.001 |

*Interaction between time period and location was significant ($P = .024$).
**Difference in MCEC pre to post was significant ($P < .001$), difference in Other sites pre to post was significant ($P < .001$).

Outcome: ACT in Control.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | | |
| Other-Pre | Reference | |
| MCEC-Pre | 4.56 (2.04-10.20) | .001 |
| Other-Post | 1.85 (0.97-3.53) | .66 |
| MCEC-Post | 1.92 (1.01-3.63) | .80 |

*Interaction between time period and location was significant ($P = .002$).

Outcome: Any AAP.

| Variable | Odds ratio (95% CI) | *P*-value |
|---|---|---|
| Location (MCEC vs Other) | 1.25 (0.84-1.86) | .27 |
| Time Period (Post vs Pre) | 1.80 (1.21-2.68) | .004 |

*Interaction between time period and location was not significant ($P = .24$).

## Discussion

Our retail clinics performed as well as or better in terms of collecting ACT scores and completing AAPs. There was no difference between the retail clinics and primary care setting in terms of hospitalizations or emergency room visits for either the pediatric or adult population. It seems that patients who choose to be seen for their asthma in the retail setting due to convenience, accessibility, etc. will receive similar care and not have worse outcomes. This is good news for retail clinics who fill a much-needed gap in helping patients have accessible, affordable health care.

There were a few limitations of our study. Many of the pediatric patients seen at our retail clinics were already

under the care of an asthma care coordinator, had up-to-date AAPs, and had been achieving good asthma control because of good asthma care at our institution. The adult population does not receive care from an asthma care coordinator, however. Our institution also changed electronic medical records several months before we began data collection. It is unknown if this could have affected the data in any way. During the time of our study, the primary care sites had implemented an asthma initiative encouraging providers to complete the ACT and update patient's AAPs to improve our community metrics. This likely contributed to a higher number of patients having ACTs completed in the primary care sites. Had they not been doing the initiative; the retail clinics may have had significantly higher rates of ACTs and AAPs completed. Unfortunately, for safety reasons, the COVID pandemic forced our retail clinics to close for a period, and we were unable to enroll our target goal of 600 patients. Fortunately, most of our patients were enrolled and had completed their 6-month period prior to this. Although the researchers anticipated the COVID pandemic may cause a significant increase of admissions post implementation, this was not the case.[20]

## Conclusion

Retail clinics may be able to provide asthma management with similar outcomes to primary care settings. This is one of the first studies to demonstrate this, but further study is recommended with more subjects. If retail clinics can manage patients with chronic disease safely and effectively, this would provide a huge cost savings by keeping patients out of emergency rooms and preventing hospitalizations. Additional study is needed to determine the effectiveness of managing other chronic diseases in the retail clinic setting.

### Declaration of Conflicting Interests

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