

AN ASTHMA ANNUAL SPIROMETRY TESTING
QUALITY IMPROVEMENT PROJECT

by

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ABSTRACT

Asthma is a chronic inflammatory lung disease that causes coughing, wheezing, shortness of breath and chest tightness. In the United States, 7.6% of adults are living with asthma, and the prevalence of asthma in Montana is 9.1% for adults. The aim for asthma management is to help people living with asthma maintain a better quality of life. In order to bridge the gap in care and provide access to asthma management, more providers need to be well-versed and equipped to meet these needs. Research shows spirometry testing helps a provider diagnose and understand the severity of a patient's asthma symptoms. The purpose of this project is to determine if implementation of a quality improvement (QI) project in clinical practice will improve annual spirometry testing for asthma patients. A 2.5-hour asthma diagnosis and management course was provided for staff implementing spirometry testing and a retrospective chart analysis was conducted, continued support over the course of a twelve-month project period and workflow changes were implemented to facilitate change. The outcome measure focused on was spirometry testing, with a goal of 85% of patients with asthma to receive annual spirometry testing. A survey was given to determine the staff's perspective on implementing the QI project. The QI project increased annual spirometry testing by 37% post intervention. Staff found the education informative and the workflow changes beneficial to improving patient care to meet the national asthma guidelines. Changes to workflow in clinical practice using a QI project could benefit future clinical practice.

CHAPTER ONE

INTRODUCTION

The focus for today's healthcare delivery system is driven by evidence-based practices. Asthma is defined as a chronic inflammatory lung disease that causes symptoms such as, coughing, wheezing, shortness of breath and chest tightness (American Academy of Allergy Asthma & Immunology (AAAAI), 2017). The total number of adults over the age of 18 in the U.S. with asthma currently is 7.6% and 12.7% were ever told they had asthma (U.S. Department of Health and Human Services, 2015). The prevalence of asthma in Montana is approximately 9.1% for adults and 6.9% in children (Montana Department of Public Health and Human Services, 2013). Asthma can be caused by environmental factors and a genetic predisposition (Hollenbach & Cloutier, 2015).

Of the 9.1% of Montanan adults who have asthma, females have a higher prevalence when compared to males (1.55 OR: 1.0 OR 95% CI: 1.35-1.8) (MDPHHS, 2013). American Indians had a higher prevalence of asthma when compared to Whites (1.2 OR: 1.0 OR 95% CI: 0.87-1.67) (MDPHHS, 2013). Some of the other characteristics of the asthmatic adults in Montana consist of household income less than \$25,000 (1.32 OR 95% CI: 1.10-1.59), current smoker (1.26 OR 95% CI: 1.05-1.52) and overweight or obese (1.58 OR 95% CI: 1.35-1.84) (MDPHHS, 2013). Furthermore, there was no significant difference of prevalence by regions in the state of Montana (MDPHHS, 2013). Only 23.8% of adult asthmatics sought two or more routine asthma care visits with a

healthcare provider over the year while 49.2% did not see their provider at all (MDPHHS, 2013).

According to the United States Department of Agriculture Economic Research Service (USDA-ERS) (2019), as of 2017 the population of Montana is 1,050,493 consisting of 680,900 rural and 369,593 urban inhabitants. The ratio of primary care providers to patients in rural locations is 39.8 providers to 100,000 people according to the National Rural Health Association (n.d.). Due to the majority of Montana being rural, access to health care can be a challenge. Therefore, it is important for more providers in the state of Montana to be able to manage all aspects of care, including asthma management.

To bridge the gap in health care the Montana Asthma Control Program (MACP) has an overall goal of helping asthmatic patients living in Montana have a better quality of life (MDPHHS, 2013). MACP aims to accomplish this through raising awareness of asthma, provide education on how to avoid environmental triggers, work with the community's stakeholders and helping Montana asthmatics manage their health (CDC, n.d.). For Montanans to achieve better quality of life, the MACP offers grants to medical clinics to facilitate a quality improvement project for asthma care. The project incorporates the Expert Panel Report 3 (2007) guidelines for the management and diagnosis of asthma. MACP staff work with the medical clinic to check for proper workflow to meet the EPR-3 guidelines.

The highest priority for this project is determining whether implementation of a quality improvement (QI) project at the providers practice will improve annual

spirometry testing for asthma patients or not. Implementing spirometry testing annually will be the focus of the QI project. The goal will be to incorporate workflow changes to help improve spirometry annual testing to meet the latest asthma guidelines. Another aim of this doctoral project is to understand the perceptions of staff implementing the quality improvement project and determine if the workflow changes resulted in better implementation of annual spirometry testing.

Background

According to the Expert Panel Report 3 (EPR-3) there are four areas to help manage asthma, assessment and monitoring, education, control of comorbidities and environment, and medication therapy (Expert Panel Report 3, 2007). Asthma is not curable or preventable, but the aim is to help control symptoms (Hollenbach & Cloutier, 2015). The focus for treatment is to reduce or eliminate symptoms and improve quality of life (Expert Panel Report 3, 2007).

Spirometry is used for diagnosing and indexing asthma severity. Schneider et al. (2009) performed a cross-sectional study on 219 adults to determine sensitivity and specificity of spirometry testing for asthma and chronic obstructive pulmonary disease (COPD). That team found the sensitivity (true-positives) for diagnosing airway obstruction in asthma was 29% (95% CI 21-39) and specificity (true-negatives) was 90% (95% CI 81-95). Spirometry for asthma had a low sensitivity, which means it does not have a strong percentage to rule out the disease. On the other hand, asthma had a high specificity when used as a diagnostic tool, therefore can rule in the disease with a high

level of confidence. Therefore, the diagnosis of asthma with spirometry should not be used alone but in conjunction with history and physical examination findings.

While only an element of diagnosis—spirometry is highly useful in disease management. According to the EPR-3 (2007), primary care providers who take care of asthmatic patients should have spirometry to aid in diagnosing and to help monitor the patient's asthma control. Spirometry is recommended for asthma patients at the initial assessment, once treatment is started and symptoms have evened out, during loss of asthma control, and a minimum of every 1–2 years (EPR-3, 2007).

Theoretical Framework

Sister Callista Roy's Adaptation Model has directed the conceptual framework of this doctoral project in various ways. Central to Roy's Adaptation Model (Roy, 2009) are the concepts of adaptation, person, environment, and health, through nursing goals to impact change in a positive way. Furthermore, Roy's Adaptation Model provides six steps which include assessment of the behavior, assessment of the stimuli, nursing diagnosis, goal setting, nursing intervention, and evaluation to help implement change (Roy, 2009). Through the four concepts and six steps, Roy's Adaptation Model (Roy, 2009) has directed this project.

One of four concepts in the model is adaptation which is using the awareness of the individual or group to bring about change in the existing environment (Roy, 2009). The second concept of person can include an individual, organization or culture that is part of the adaptive system (Roy, 2009). For this asthma quality improvement project, the pulmonology clinic was the organization being targeted to facilitate change in the

adaptive system. The third concept environment is what influences the individual or groups' change through circumstances and conditions (Roy, 2009). The environment for this project consisted of how the staff interacted with the workflow processes and patient care. A state of being whole is the concept of health making up the fourth concept. The goal of nursing is to help facilitate the process of adaptation for the individual or group (Roy, 2009). The overall nursing goal for the quality improvement project was to improve the health of the asthmatic patients being treated at the clinic.

Roy's Adaptation Model (Roy, 2009) facilitated the management of the project by using six steps to implement change. The first step of behavior assessment was completed by doing a chart review of the asthmatic patients being seen at the clinic, and workflow roles were identified. The goal was to summarize the big picture as discussed by Roy (2009). Learning how the individual roles interacted with the workflow process was determined in the assessment of stimuli. In terms of developing a nursing diagnosis, a plan of action was devised to bring about meaningful change. For each part of the plan of action to complete, goals were set to accomplish the necessary changes. To meet the needs of the individuals completing the Quality improvement project, conference calls were held monthly to mitigate and successfully support the changes being implemented, fulfilling the nursing intervention step. Lastly, an evaluation was done through a three-question survey for the staff involved in the QI project to determine benefits and barriers. Roy's Adaption Model (2009) proved valuable to help with the planning, implementation, and evaluation of this doctoral project.

Examination of the Evidence

Academic databases were utilized to conduct a thorough review of the existing literature. The years of evidence examined included 2009 to 2018, using journals from databases such as CINAHL and Web of Science. The following literature review shows the need for a quality improvement project to incorporate spirometry into clinical practice to meet the EPR-3 asthma guidelines.

Gupta et al. (2016) conducted a pretest-posttest analysis of hands on education and mentorship for spirometry knowledge in primary care practices over the course of one year. Gupta et al. found an increase in knowledge for spirometry when comparing pre-intervention 21.4 +/- 3.1 to 27.3 +/- 3.5 post-intervention ($p < 0.01$). Furthermore, knowledge that had been gained from the intervention remained after one year. Usage increased, according to Gupta et al., through spirometry orders pre-intervention 75/512 (14.6 %) and 129/336 (38.4 %) during intervention of respiratory visits ($p < 0.01$), and in pre-intervention 20/3490 (0.6 %) and 36/2649 (1.4 %) during intervention of non-respiratory visits ($p < 0.01$). Gupta et al. continued the study had positive results for increasing the knowledge and use of spirometry in primary care practice. Another study by Heffler et al. (2018) evaluated the use of spirometry in the diagnosis and management of asthma and COPD. Heffler et al. found 112 (55.2%) patients who had been diagnosed with asthma ever had spirometry performed in their lifetime prior to the intervention. Furthermore, Heffler et al. explained out of the patients who had spirometry in their lifetime, had an average of 47 months (95% IC: 31.3–62.6 months; range: 1–240 months)

since the last spirometry was performed. Heffler et al. recommended implementing education and bringing attention to spirometry in primary care practices.

Gupta et al. (2017) found through a prospective one-year study no change in behavioral intention after a mentorship program was implemented to improve spirometry use in primary care. The investigators explained the health professionals being mentored found it to be satisfying and were willing to be a part of a group again. Gupta et al. discovered positive feedback from the intervention but showed no statistically significance for changing behavior.

Koefed et al. (2013) performed a cohort study for patients (age >18) with obstructive lung disease receiving medication for the first time and spirometry performance. Koefed et al. found that group practices were more likely to order spirometry testing having a higher odds ratio versus individual practices (OR 1.24, CI 1.09-1.40). Koefed et al. felt the differences in performance would suggest a quality improvement project is needed.

Weidinger, Nilsson, and Lindblad (2009) conducted a retrospective observational study to determine use of spirometry in primary care practice in Sweden. Weidinger et al. found only 167 (33%) patients out of 499 with asthma had spirometry or peak expiratory flow (PEF) at their first office visit and only 130 (60%) asthmatic patients had spirometry at follow up. Weidinger et al. concluded there is a need for quality improvement involving evaluation of patients with asthma and COPD.

Yawn et al. (2016) compiled a retrospective study along with patient reported data to check compliance with the 2007 asthma guidelines. Yawn et al. explained one of the

guidelines checked was asthma control documentation. Yawn et al. continued asthma control was checked in 15% of the patients at minimum one time over a year period and only 50% used a validated instrument. In conclusion, the study found poor compliance with asthma control. Lei and Sokol (2017) also found through a retrospective cross-sectional analysis of spirometry use in asthma, poor compliance with spirometry. The authors found prior to intervention of an electronic medical record (EMR) reminder; spirometry was performed in 26.6% of asthmatic patients. Lei and Sokol recommended an EMR reminder system to help with spirometry compliance.

Abrahamson et al. (2010) performed a cluster randomized control trial to determine if there were improvements in asthma and COPD patient outcomes with use of spirometry and follow up appointments in primary care practices. Abrahamson et al. explained the intervention group received three-monthly spirometry tests along with follow up visits to discuss results of spirometry. Abrahamson et al. found no statistically significant improvements from baseline of quality of life scores over the course of 12 months, as well as respiratory symptoms, asthma attacks, action plan compilation, days missed from daily activities or using health care services.

Mangione-Smith et al. (2017) conducted a cluster randomized controlled trial focused on primary care pediatric clinics to determine if the spirometry 360 quality improvement project was effective at improving spirometry test quality and improve patient outcomes. According to Mangione- Smith et al. the spirometry 360 quality improvement intervention incorporates web-based training for participants who will administer the spirometry test along with data collection of the tests conducted to

determine administration efficacy. Mangione-Smith et al. found preintervention 25.4% of the control clinics spirometry tests were of good quality compared to the intervention clinics 50.4% had spirometry tests of good quality. During postintervention 28.7% of the control clinics spirometry tests and 49.9% at the intervention clinics were of good quality. Mangione-Smith et al. explained there was no significant difference between the control and the intervention groups for patient outcomes. The study was conducted for pediatric clinics which may not reflect potential for change in adult primary care practices.

Overall, the literature confirms spirometry is necessary and shows practices have poor compliance due to limited awareness of the value of the tool and current guidelines for annual use. Primary care providers are reminded that the current evidence-based practice is annual use of spirometry, but further work is necessary to understand why this practice has poor clinical utilization. Therefore, spirometry adherence, as recommended by the EPR-3 guidelines is needed. Through examination of the evidence, a quality improvement project to help with compliance of spirometry is warranted. Furthermore, more research is needed to determine the effectiveness of improving workflow processes for spirometry in primary care practices.

CHAPTER TWO

METHODS

Participants, Study design and setting

The study conducted included a retrospective chart analysis from November 30, 2016 to November 30, 2017. The population of interest was patients with a diagnosis of asthma in the setting of a pulmonology office in Montana. Participants also included the staff at the pulmonology practice. Three staff members including the family nurse practitioner, respiratory therapist and medical assistant were involved in the implementation of the project.

No ethical issues were noted. An expedited review through the Institutional Review Board (IRB) MB060618-EX indicated the study was exempt from IRB approval. During the review, 36 patients met the inclusion criteria. Inclusion criteria consisted of a diagnosis with the following ICD-10-CM codes J45.2x -J45.5x, J45.901, J45.902 and J45.909 between the dates of November 30, 2017 to January 2019 and the patients who were only being seen for their asthma. Charts were excluded if a diagnosis of chronic obstructive pulmonary disease was listed. If a patient was seen more than once during the twelve-month observation period, only one abstraction was completed. The main goal of the project was to increase the percentage of patients with an asthma diagnosis to receive annual spirometry. To accomplish the goal, workflow processes were assessed. Improvements were made to the workflow to help the staff check for last spirometry test

and to incorporate completion and or scheduling the test. A survey was given at the end of the year-long QI project to assess the efficacy of the workflow changes.

Survey

A voluntary survey was administered to the staff who were involved in the implementation of the QI project. The respondent categories included a provider, medical assistant and respiratory therapist. The survey consisted of three evaluation questions to determine the pros and cons of the QI project from the perspective of the staff implementing the project (Appendix A). The survey was distributed during the final site visit and collected at the end of the meeting. Two of the three respondents were absent; therefore, their surveys were returned via email.

Intervention

A 2.5-hour training course was provided by the MACP given to the providers and healthcare personnel at the clinic who implemented the asthma quality improvement project. The training education discussed the latest in asthma diagnosis and management using the EPR-3 guidelines. The training was approved for continuing education credit for both providers and registered nurses.

Following the educational training, an initial one-year retrospective chart review was conducted to gather data on the asthmatic patients in the clinic. The chart review used asthma ICD-10 codes J45.2x-J45.5x, J45.901, J45.902, and J45.909 for patients seen at the clinic. Next the data was reviewed to determine the percentage of patients who

had a spirometry test conducted within the last year. Lastly, comparison of the percentages with state average and target goal to calculate the difference was completed.

Implementation

The Plan-Do-Study-Act (PDSA) Cycle was used to facilitate the change over the course of one year. The key outcome measure collected was annual spirometry testing completed for each patient with an asthma diagnosis. The providers, respiratory therapist and medical assistant implemented the project while this author and the MACP staff facilitated the PDSA Cycle through monthly work sessions by conference call. The PDSA Cycle aim was to have 85% of patients diagnosed with asthma have a completed spirometry test done annually. The plan included steps to improve the workflow process to meet the 85% target goal. Monthly conference calls were used to discuss the results of implementation steps to meet the EPR-3 guidelines, to evaluate what happened when the workflow steps were completed and to assess for needs and concerns during the year-long project.

Evaluation

During the implementation phase the quality improvement was modified to fit the practice needs to meet the EPR-3 guidelines. Time series measurements were taken to evaluate effectiveness of workflow changes. Chart reviews were conducted prior to the start of the changes, half-way into the project and upon completion of the PDSA cycle. Data was compared with the data at the start of the cycle to see if improvements were captured. Staff were asked about the positive and negative aspects of implementing the

EPR-3 guidelines during the final site visit. Suggestions of where the clinic could go from there were discussed.

CHAPTER THREE

RESULTS

Participants (n = 41 participants; males = 17, 41%; females = 24, 59%) primarily identified as Caucasian (n = 38, 93 %). The average age was 61 years at the time of the final chart review. Participants were insured by Medicare (n= 19, 46.3%), Medicaid (n = 3, 7.3%), and private insurance carriers (n= 19, 46.3%). Patients were assessed for tobacco use, vaccination status, attending an urgent care visit within the last year, oral corticosteroid (OCS) therapy within the last year, and previous hospitalization due to asthma (see Table 1).

Based on gender, of the patients who used Medicare for their services, females were higher in number (n= 13) compared to males (n= 6). For private insurance carriers, females came in higher (n=10) than their male counterparts (n= 9). For Medicaid holders, males were higher (n= 2) than females (n= 1). From the study, females had a higher prevalence for four of the seven risk factors studied, current pneumococcal vaccination, current flu vaccination, urgent care visit within the last year and prescribed OCS within the last year (see Table 1).

Risk Factor	Male N=17	Female N= 24	Percentage out of N=41
Medicare	6	13	46.3%
Private Insurance	9	10	46.3%
Medicaid	2	1	7.3%
Current Smoker	0	0	0%
Former Smoker	3	2	12.2%
Have current pneumococcal vaccination	0	4	9.8%
Have current flu vaccination	6	7	31.7%
Visited urgent care at least one time in last year due to asthma	0	1	2.4%
Have been prescribed OCS at least once during the last year due to asthma	0	4	9.8%
Have been hospitalized due to asthma in the last year	0	0	0%

Table 1: Insurance carrier and risk factors by gender noted during the final chart review

In response to the survey question, what has been the best part about the quality improvement project, respondents (n = 2) reported improvements in practice and patients who needed lung function help but would have been missed without the workflow

changes as well as help with future testing and annual visits. From the survey question, what were the challenges to implementing the quality improvement project, respondents reported a couple barriers to implementing the project. One of the main barriers was information technology (IT) and figuring out how to navigate the changes in the electronic record system. From the final survey question, how will this quality improvement project make a difference in your care of the patient, the respondents reported the project would make a difference in their patient care through having consistent measures for asthma management and the increased knowledge gained from the education that was provided.

Chart review was used to determine annual spirometry rates at the practice location before and after the intervention. The practice was at 22 % for annual spirometry testing before this project. An 85% annual spirometry rate was set as the goal for the completion of the project. After the twelve-month project period, the practice has achieved a 59 % annual spirometry test rate. This represents an increase of 37 % for annual spirometry testing obtained upon completion of this QI project.

CHAPTER FOUR

DISCUSSION

Twelve-Month Project Period

Over the course of the twelve-month project period several monthly phone conference calls took place to facilitate the changes for the QI project. After the initial chart review was completed our first telephone conference call took place. During this conversation it was decided amongst the clinic staff that the area to focus on for the project would be annual spirometry testing as this was low in compliance for meeting the EPR-3 guidelines. Current workflow processes were discussed to understand what could be improved upon during the project.

In the next monthly call, we discussed the new workflow changes proposed to improve frequency of spirometry testing. The workflow changes included the medical assistant (MA) making a note on the hard copy check-in form indicating whether spirometry had been performed in the past twelve months while rooming each patient with asthma. Next, the provider reviews the MA note and discusses with the patient about completing a spirometry test. If the patient is willing to complete the spirometry test, the provider notifies the respiratory therapist (RT). If the RT can complete the spirometry test at that time, the RT comes to get the patient and perform spirometry and then takes patient back to the room. At that point, the provider comes back to speak with the patient about the results of the spirometry test. If RT unable to complete the spirometry test at that time, then patient asked to stop at reception desk to schedule time to complete test. If

patient refuses spirometry testing all together after speaking with the provider about it a note will be made in the chart.

The next call was centered around checking in with the clinic staff (provider and RT) to see how the workflow changes were implemented. The provider shared that the first step was not being completed because their MA had quit but were okay with since it felt like an extra unnecessary step. The clinic instead created a problem list before each scheduled patient checked in for the day which included whether spirometry was done or not within the past twelve months. The staff felt the rest of the workflow changes were easy to implement and beneficial.

On the next call it was determined that the clinic was not seeking out to remind patients that they need to come in for spirometry. One of the limitations was from the transition of paper to electronic charting. Staff felt it was challenging finding the reportable data because they needed to dig into the charts, for example patient education was found in different places. Discussed the possibility of adding another area to focus on during the QI project on top of annual spirometry testing. The staff and MACP considered smoking cessation as a possibility to incorporate.

During the project, the MACP coordinator changed and therefore, two months passed before another conference call was done. The clinic hired a new MA during that time away. Next steps for the project were discussed. Health Technology Services and a representative from the MT Tobacco Program talked about the different resources that are available from the tobacco program and what steps need to be taken in the electronic

health record system to document correctly and have that data “reportable”. Site visit was scheduled during the conversation.

A site visit about half-way through in the twelve-month project period took place. The goal was to determine ways to improve reporting capability, obtain data collection, and to determine patient outreach and follow-up needs. For assistance with reporting capability, Health Technology Services were invited to the site visit. During the visit, a mid chart review was completed to see if the QI project was making head way towards increasing spirometry compliance.

During the next call after the site visit Health Technology Services identified ways to improve reportable data for asthma. The action items included working with IT to create a report out of EPIC for current performance on spirometry, work with IT to gain access to asthma flow sheets, determine if able to use of asthma flow sheets, determine if order entry will effect reporting data in EHR, find an asthma action plan that is not specific to pediatrics, work with IT to get tobacco screening/cessation CQM modified and available for providers.

The next phone conference call discussed the challenges with trying to get the IT changes made in the short amount of time left in the project period. The staff decided to focus only on annual spirometry testing for the remainder of the project. The staff would consider for future projects IT changes and smoking cessation.

On the final call for the project a meeting time was determined for the final site visit. Staff were eager for the final site visit to see the changes in annual spirometry

testing. MACP mentioned the Big Sky Pulmonary Conference coming up after the project was over. The staff shared their continued success with the workflow changes.

At the final site visit, pros and cons of the project were discussed by the provider. The staff recommended including IT help earlier on. The staff found it a challenge to have MACP coordinator and MA change during the project. Overall, the staff found the QI project helpful, educational and worth the time. MACP coordinator shared education materials from MDPHHS are always available to the clinic for use. There are 2-3 educational webinars for the providers after the grant period. The continued support post project period from the MACP was appreciated by the provider.

Spirometry in Practice

While the practice already had a spirometer, the grant money received from MACP could be used for purchasing a spirometer at other practices. Spirometry can be performed by nurses, respiratory therapists, nurse practitioners, physician assistants and physicians. The objectives for adding spirometry to practice include:

- Aid in clinical decision making objectively through assessment and monitoring of lung function
- Meet national guidelines for quality care
- Generation of revenue for the clinic

Project Cost Analysis

The cost for the provider to have a diagnostic spirometer in practice is around \$2,000 (Ferguson et al., 2000). Furthermore, to operate the spirometer it costs

approximately \$10 for each test which includes personnel time, training, and supplies (Ferguson et al., 2000). According to Choosing Wisely (2016), a spirometry test costs the patient less than \$100. Initial training for staff members including healthcare personnel who will administer the spirometry test and providers to learn interpretation of results is needed. The cost for the training in Montana is \$90 per person for a half-day session which includes 3.5 continuing education credits (American Lung Association, 2019). A practice would require the staff who utilize the spirometer to attend the training. In summary, to purchase and utilize the spirometer, \$2,000 plus the cost of staff training will be needed to fund the project initially. To maintain and use the spirometer on a daily basis, \$10 per test is needed in addition to six percent of the reimbursement rate for coding.

The American Association for Respiratory Care (2018) explains that office spirometry will be covered under Current Procedural Technology (CPT) code 94010 if a graphic tracing is captured, including total and timed vital capacity and expiratory flow rate. For a complete Breathing Capacity test also known as Spirometry, Medicare Part B will reimburse \$36.72 as of 2018 (Plummer, 2018). The Indian Health Service (IHS) pays per outpatient visit not per service performed, totaling \$455 according to the Federal Register (2019) excluding Medicare. The national average reimbursement amount is \$36.08 according to QRS Diagnostic (2012) which is based on data across the nation by the Medicare fee analyzer along with other organizations who have reimbursement tracking.

Break-Even Analysis

	Medicare
Price for reimbursement	\$36.72
Less variable costs per spirometry test (Supplies, training, personnel time- \$10 and coding- 6% of reimbursement)	(\$12.20)
Contribution margin per spirometry test	\$24.52

Table 2: Break-Even analysis based on Medicare reimbursement

Based on Medicare reimbursement with the costs of having to run the spirometer each time, a practice would need to perform 97 spirometry tests to break even. Private payors will typically reimburse at a higher rate, therefore, making the time to break even sooner. The break-even analysis was performed on Medicare reimbursement alone due to its low return rate to determine longest break-even point. A practice, training 4 spirometry users, would need to perform two spirometry tests per week to break-even within one year, based on a contribution margin of \$24.52. While this project is specifically discussing asthma only, spirometry can be used for other diseases as well, such as, chronic obstructive pulmonary disease (COPD), increasing the potential for revenue gain.

Limitations of Study

MACP primarily focuses on primary care practices for the diagnosis and management of asthma QI projects. During the start of the project, the original site was a

rural primary care practice. The site was then changed to the specialty care practice when the QI project fell through due to challenges with implementing changes at the rural primary care practice.

The scholarly project was a small-scale quality improvement project at one clinical practice, and therefore the results are non-generalizable. Similarly, the qualitative questions asked of staff members were for the purposes of gaining feedback on changes to the practice workflow and were hypothesis generating only. Another challenge during the project was the MACP coordinator changed. A change of this nature potentially altered the continuity of the project. The MACP coordinator change affected the project work by the amount of time spent catching the new coordinator up to speed therefore, taking away time from working on the project.

A challenge in the completion of this project was the practice transitioned from paper charts to electronic health records. As a result of this transition, the initial chart review from paper records may not have captured every client and may have led to under-reporting the pre-intervention annual spirometry rate.

CHAPTER FIVE

CONCLUSION

The most important finding from this project was that the intervention resulted in a 37% increase in annual spirometry testing. This is a significant improvement, even though the target goal of 85% was not achieved. It would be beneficial to understand if the target goal was set too high for the practice or more changes needed to occur to meet the goal. Overall, the staff found the project helpful for working towards meeting the EPR-3 guidelines for annual spirometry testing. The staff were appreciative of the education provided from the QI project.

The QI project found a comparable pre-intervention annual spirometry compliance rate, 22%, to Lei and Sokol's (2017) study of 26.2%, Yawn et al. (2016) found only 15% of asthma control were checked at least once per year, and Weidinger et al. (2009) had a compliance rate of 33%, illustrating low compliance with the EPR-3 guidelines. After implementing workflow changes to create reminders for spirometry testing, as Lei and Sokol (2017) recommended, an increase in testing frequency was seen in the Montana clinical practice. As Koefed et al. (2017) found, individual practices were less likely to perform spirometry testing as seen with this small pulmonology practice. Overall, this shows the pulmonology practice was comparable to the other study's pre-intervention compliance results.

When compared to Gupta et al.'s (2017) study the staff found the mentorship helpful, whereas the QI project was beneficial to the staff as well as showed improvement in testing frequency. Gupta et al. (2016) found an increase in spirometry testing after

education and mentorship was given by 38% during the intervention, which is comparable to the QI project which achieved a 37% increase. Furthermore, the results from the survey showed an increase in asthma management knowledge. This project shows a positive influence from education and mentorship like the current evidence.

Future research should focus on multiple clinics in one study to have a larger sample size for better strength. Another area for research to address would be studying specific workflow changes to determine what would be the most beneficial to achieve annual spirometry testing. It is unclear whether these improvements will continue, therefore, future research could focus on a one-year post intervention study to determine if the same percentage or more in spirometry testing annually is still occurring.

As indicated in the discussion, including spirometry in practice, providers will have less referrals to specialty clinics. This in turn will increase the quality of care provided to asthma patients. After reaching the break-even point for the purchase of the spirometer, revenue will be gained at the practice for future use. Furthermore, having spirometry in practice can save the patients time and money because they would not have to travel to another appointment or see a specialist.

Overall, the asthma annual spirometry quality improvement project has shown to improve annual spirometry testing frequency. Through the framework of Roy's Adaptation Model, the QI project has been able to facilitate positive change within the provider's practice. The QI project demonstrated results for annual spirometry testing similarly to the current evidence. As shown through the survey, the staff valued the education and improvements seen in spirometry testing as a result of the QI project.

Implementing changes in workflow using a QI project could benefit future clinical practice.

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APPENDICES

APPENDIX A

ASTHMA QUALITY IMPROVEMENT QUESTIONNAIRE

Purpose Statement: The purpose of this follow-up evaluation is to gain insight into the benefits and challenges of implementing the quality improvement project.

Participation is voluntary.

Questions:

1. What has been the best part about the quality improvement project?
2. What were the challenges to implementing the quality improvement project?
3. How will this quality improvement project make a difference in your care of the patient?

Note: Survey given to the staff who participated in the implementation of the asthma quality improvement project.

APPENDIX B

EVIDENCE TABLE

AUTHORS(s)	TYPE OF STUDY	SAMPLE	SUMMARY OF RESULTS
Abrahamson et al. (2010)	Cluster randomized control trial To determine if there were improvements in asthma and COPD patient outcomes with use of spirometry and follow up appointments in primary care practices	N= 31 practices Spirometry? YES	Found no statistically significant improvements from baseline of quality of life scores over the course of 12 months, as well as respiratory symptoms, asthma attacks, action plan compilation, days missed from daily

			activities or using health care services
Gupta et al. (2016)	Pretest-posttest analysis Hands-on-education and mentorship for spirometry knowledge in primary care practices over the course of one year	N=7 sites Spirometry? YES	The study and had positive results for increasing the knowledge and use of spirometry in primary care practice.
Gupta et al. (2017)	Prospective study A study to assess change in behavioral intention after a mentorship program was implemented to improve spirometry use in primary care	N=25 nurse/allied health and 23 physician mentees Spirometry? YES	Positive feedback from the intervention was found but showed no statistically significant

			behavior change
Heffler et al. (2018)	Quantitative study design Evaluated the use of spirometry in the diagnosis and management of asthma and COPD	N=300 patients Spirometry? YES	Found out of the patients who had spirometry in their lifetime, an average of 47 months passed since the last spirometry was performed. Low spirometry testing shown
Koefed et al. (2013)	National Cohort study Determine if practice characteristics were linked to	N= 35,677 patients	The study found with an increase in

	spirometry testing for patients getting medication for the first time in obstructive lung disease.	Spirometry? YES	practitioner age there was a decrease in spirometry testing, and partnership practices were more likely to perform spirometry testing compared to individual practices. Approximately half of the patients received spirometry testing.
Lei and Sokol (2017)	Retrospective cross-sectional analysis	Spirometry? YES	An EMR reminder

			increased the frequency of spirometry testing
Mangione-Smith et al. (2017)	Cluster randomized controlled trial Focused on primary care pediatric clinics to determine if the spirometry 360 quality improvement project was effective at improving spirometry test quality and improve patient outcomes.	N=25 pediatric primary care practices Spirometry? YES	Not effective at improving quality of spirometry testing or for reported patient outcomes. Study was conducted for pediatric clinics which may not reflect potential for change in adult primary care practices

Weidinger, Nilsson, and Lindblad (2009)	Retrospective observational study Determine use of spirometry in primary care practice in Sweden	N=499 asthmatic patients Spirometry? YES	Found 167 (33%) patients out of 499 with asthma had spirometry or peak expiratory flow (PEF) at their first office visit and 130 (60%) asthmatic patients had spirometry at follow up
Yawn et al. (2016)	Retrospective study Study to check compliance with the 2007 asthma guidelines including asthma control documentation	N=1176 patients Spirometry? NO	Asthma control was checked in 15% of the patients at minimum one time over a

			year period and only 50% used a validated instrument. Overall, the study found poor compliance with asthma control
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