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IMPROVING EVIDENCE BASED ASTHMA MANAGEMENT IN AN URBAN UNIVERSITY STUDENT HEALTH CENTER

by

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1990

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A doctoral document submitted in partial fulfillment
of the requirements for the

Doctor of Nursing Practice

School of Nursing
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May 2012

THE GRADUATE COLLEGE

We recommend the Doctoral Project prepared under our supervision by

Hedian Swanson

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Improving Evidence Based Asthma Management in an Urban University Student Health Center

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ABSTRACT

Improving Evidence Based Asthma Management in an Urban University Student Health Center

by

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The purpose of this project was to improve asthma management through focused staff education and training on national asthma guideline recommendations. The Student Health Center (SHC), located in a university in the southwest United States, performed annual reviews of asthma-related electronic medical records (EMR) in an effort to provide quality health care. These reviews used 23 quality improvement (QI) parameters extracted from the 2007 National Asthma Education and Preventive Program Expert Panel Report 3 (NAEPP EPR 3). The SHC QI findings were consistent with current asthma management literature indicating asthma control is often overestimated and undertreated. This project (a) provided the SHC staff with ongoing education on the national guidelines for improved evidence based asthma management and (b) measured changes in asthma care as reflected in the EMRs. The annual asthma QI data reviewed in June 2010 established a baseline for comparison and noted weak areas for focused staff education. Two asthma EMR reviews were conducted in Spring 2011 and in the Fall 2011. The Fall results demonstrated statistically significant improvement from both the baseline review and the Spring 2011 review. Therefore, staff education is an effective method for improving asthma diagnosis and management at the SHC.

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CHAPTER 1

INTRODUCTION

Asthma is a chronic inflammatory airway disease affecting all ages. Recently, the National Center for Health Statistics reported 24.6 million Americans (8.2 %) have asthma (Akinbami, Moorman, & Liu, 2011). Although asthma is known to be a reversible disease, studies indicate over time, patients with poorly managed asthma have lower lung functions, even when asymptomatic, and greater decline with exacerbations (Chiang & Hsu, 1997; Donaldson, Seemungal, Bhowmik, & Wedzicha, 2002). Student Health Center (SHC) clinicians (physicians, nurse practitioners, and physician assistants) manage patients with asthma on a daily basis. Guideline tools are essential to manage asthma effectively (Tumiel-Berhalter & Hershey, 2005). According to the American College Health Association (ACHA, 2010), 8.6% of students reported diagnosis or treatment for asthma by a health professional within the previous 12 months.

ACHA has no specific asthma recommendations; rather, they refer clinicians to external resources for college policies or government agency guidelines such as those provided by the Agency for Healthcare Research and Quality (AHRQ). ACHA does have, however, standards of practice for health promotion in higher education in which they recommend theory-based and evidence- based practice (ACHA, 2005). Asthma continues to be a debilitating illness for many students in urban college settings even when effective treatments are available. University students have access to cost-effective, quality care at the SHC. Being in an academic institution, the SHC leadership encourages the use of national guidelines and evidence based practice. Although SHC providers manage patients with asthma on a daily basis, the diagnosis and management of asthmatic patients varies among the providers. Furthermore, the utilization of existing

resources in the SHC is inconsistent. This capstone project aimed to reinforce the systematic diagnosis and management of asthma through formal and informal education of staff and patients by utilizing the National Asthma Education and Preventive Program Expert Panel Report 3 (NAEPP EPR 3). Effective asthma management improves students' symptom control, quality of life, and risk of adverse events. However, the literature discussing asthma management within a college or university setting is sparse.

Challenges: The Problem

Although the SHC clinicians were familiar with the 2007 NAEPP EPR 3 guidelines, there were no specific clinic guidelines to manage asthma. Systematic implementation of institutional guidelines influences providers' treatment decisions for patients with asthma (Carlton et al., 2005). Implementation of national guidelines improves some areas of management, such as patient assessment, medication therapy, and patient education (Self, Usery, Howard-Thompson, & Sands, 2007), but the implementation may require additional staff training. The SHC performs annual quality improvement (QI) projects by reviewing electronic medical records (EMR) on various topics. For the past two years, asthma QI was based on 23 parameters extracted from the 2007 NAEPP EPR 3 guidelines. The QI findings indicated asthma management varied widely among clinicians and that intake procedures were inconsistent among the nursing staff. These QI findings were consistent with the concern that more specific clinic-wide guidelines were needed. To provide high quality asthma care, the SHC aimed to meet QI criteria for 90% of the patients' records. The SHC exceeded expectations in certain areas, but in others, fell below expectations. Less than acceptable scores occurred in asthma monitoring with a pulmonary function test (spirometry), patient education on medication

and asthma triggers, appropriate asthma diagnosis for category and severity, and asthma-related discharge instructions. Intake and documentation by nursing staff more consistently followed the parameters for current symptoms (chief complaints for the visit), ACT scores, and peak flow meter readings. The QI review indicated needs for closer illness monitoring, better documentation, and improved patient education for increased patient compliance.

Purpose

The purpose of this project was to improve asthma management in an urban university SHC through focused staff education and training on national asthma guideline recommendations. Improvement was indicated by compliance with the NAEPP EPR 3 guidelines as measured in an asthma QI review of student EMRs. Compliance with the guidelines was determined by the presence or absence of 23 quality parameters in the randomly selected EMRs that contained an asthma diagnosis. Although the providers received a summary report of the 2007 NAEPP EPR 3, their detailed treatment protocol for each student was not mandated for the purpose of this project.

Significance of Project and Intervention: Policy Implication

This project in asthma management, which was a collaborative effort between the SHC staff and their patients, intended to reinforce the SHC clinical staff's use of systematic management guidelines for asthma. The author believed that consistent use of nationally recognized guidelines for evidence based practice (EBP) would increase patients' compliance and their quality of life. The SHC is an example of nursing leadership. It is an advanced practice nurse (ANP)-managed clinic with easy access and

cost-effective care. This project is an APN initiative to implement evidence-based practice in asthma care.

CHAPTER 2

REVIEW OF LITERATURE

The goal of this capstone project was to improve evidence based asthma management in an urban university student health center by utilizing national guideline recommendations. To evaluate the SHC's quality of care for patients with asthma, two EMR reviews were used to check the SHC QI parameters for asthma management. To improve asthma management, given the previous years' QI findings, this author provided asthma-related staff education to reinforce EBP asthma care. The EMR findings were compared with previous years QI findings to determine if staff education made a difference.

This literature review includes general information about asthma; specific issues about college students; the implications of asthma management guidelines; highlights of national guidelines; clinical practice guidelines (NGC -5905) specific to asthma diagnosis and management; provider and patient barriers common to asthma management; measures for periodic assessment; and patient education.

Asthma

Asthma is a chronic inflammatory disease of the airway that causes reversible obstruction by narrowing and clogging the air passages due to hyper-responsiveness to stimuli (National Heart, Lung, and Blood Institute, 2007). Although the exact cause of asthma is unknown, genetic predisposition and environmental exposure factors seem to be the main cause. The World Health Organization (WHO) reports that 300 million people suffer from asthma, that it is the most common chronic illness among children, and that it occurs in all countries, but over 80% of asthma deaths occur in lower income

countries (WHO, 2006). In spite of international asthma guidelines (such as Global Initiative for Asthma) and nationwide U.S. guidelines, asthma is underdiagnosed and undertreated. The most common causes are indoor and outdoor allergens, tobacco smoke, chemical irritants, air pollution, cold air, extreme emotional arousal, aspirin sensitivity, anti-inflammatory drugs, beta-blocker medications, and gastroesophageal reflux disease. Asthma affects quality of life (Schatz et al., 2007) and productivity, and it causes economic loss and emotional distress.

Project Objectives and Specific Aims

The goal of this project was improved quality of asthma care as evidenced by statistically significant increases in the utilization of the national guidelines for asthma diagnosis and management over two periods of structured staff education and training. One objective to accomplish this goal was education and training to ensure SHC staff would be familiar with national guidelines for asthma. Table 1 details the time line for training, and Appendices A and B provide content examples.

A specific aim of this project was staff utilization of asthma subjective, objective, assessment and plan (SOAP) charting (see Figure 1) that was to be evaluated as an EMR review that met the QI parameters (see Figure 2). The SOAP charting could be completed quickly and easily. Another aim was for SHC clinicians to use an asthma care action plan in order to assist students with self-management and to include a measure of frequency in the EMR review QI parameter 5a. Evidence of student education about asthma management was evaluated by EMR review of positive findings of QI parameters 5c, 5d, 5e, 5h, and 5i. A final aim was an increase in spirometry orders for periodic monitoring of pulmonary function evidenced by an increase in the number of spirometry tests performed by the end of each study period. The author had posited that staff

education and training on asthma national guidelines would positively affect the remaining objectives, which would result in improved asthma management by SHC patients and providers.

SOAP Template

Subjective

Current medication:
Symptoms patient experiences:
Frequency of rescue inhaler use:
Allergy symptoms or triggers:
Home Peak Flow Meter use and readings: yes/No Normal values___ ___ ___
Prior PFT (Spirometry) status: Year_____ Normal/Abnormal
PMH ER visits or hospitalization for asthma:

Objective

ACT score:
Measured Peak Flow readings and SaO2:
Physical exam
HEENT:
Eyes:
Ears:
Nose:
Throat:
Neck:
Cardiovascular Exam:
Respiratory Exam:

Assessment

Asthma diagnosis
Level of asthma

Plan

SVN treatment given: Yes/No Response:
Asthma action plan: Yes/No
Recommend spirometry testing
Medication education: Rescue medication Yes/No
Proper use of controller Yes/No/Wean off
Monitor frequency of rescue medication
Control external triggers (i.e., dust/animal/dust mites/pollens/food/exercise): Yes/No
Referral: Yes/No
Treatment for comorbid condition appropriate for asthma: Yes/No

Follow up: Shorter interval if increased use of rescue medication or new symptoms (e.g. nighttime awakening)

Figure 1. Asthma visit SOAP note template.

The 23 Parameters

1. 1a: ACT Score
2. 1b: Current medication
3. 2a: Symptoms patient experiences
4. 2b: Frequency of rescue inhaler use
5. 2c: Indicated allergy symptoms or triggers
6. 2d: Indicated used of home Peak Flow
7. 2e: Prior PF-T status
8. 2f: Indicated PMH ER visit or hospitalization for asthma
9. 3a: Physical exam for upper airway
10. 3b: Physical exam for lung exam
11. 3c: Measured Peak Flow reading and SaO2
12. 3d: Administration of albuterol nebulizer treatment and documented response
13. 4a: Diagnosed with asthma
14. 4b: Documented level of asthma
15. 5a: Indicated written asthma action plan given to patient
16. 5b: Documented education about medications
17. 5c: Appropriately used controller medication
18. 5d: Discussed control of external triggers
19. 5e: Indicated follow up interval
20. 5f: Referred to specialty care
21. 5g: Treated for comorbid conditions appropriate for asthma
22. 5h: Recommended wean off unnecessary controller medications
23. 5i: Recommendation to direct f/u based on rescue inhaler us

Figure 2: Assessment tool: QI parameters. Used with the permission from Pamela Gross, MD, Ph.D. (Personal communication, November 30, 2010).

Study Question and Assumptions

Does staff education affect quality improvement (QI) of asthma patient care at a university student health center? A well-documented EMR reflects the quality of care provided to the patient. Staff Education improves the quality of care provided to patients. National guidelines, such as NAEPP EPR 3, were developed from random-trial research studies and systematic reviews of research data. For the purpose of this project, *evidence*

based practice was defined as practice that follows the national guidelines. The 23 parameters used in the QI report accurately measured adherence to the national guidelines.

Population Identification: College Student Issues

During this study, the SHC was utilized by a broad spectrum of age groups, from young adults to older adults. The patients represented a cross section of society: single and married with families, international students and locals, gay and straight, commuters and dorm residents, and the insured and the uninsured. The SHC was located on a university campus with an enrollment of approximately 27,000 and on-campus residence chosen by only 5% of undergraduates in 2012. The SHC appointments were based on same -ay service. All students who paid the student health fee could utilize any clinic services, but participation in this plan did not cover the cost of procedures, labs, or medication. Students who purchased additional university sponsored student health insurance paid 20% of the total costs. However, based on clinic informal estimates, about 30% of students did not have any health insurance. Without insurance, the SHC was the only clinic available where students could have access without additional fees to see clinicians.

The health policy implemented in the Patient Protection and Affordable Care Act (PPACA) is an attempt at the national level to provide more support for insuring this group of college students. While research data has been extremely limited, expert opinion has suggested that making insurance more affordable will, as an interim measure, increase voluntary rates of insurance until it becomes mandatory in 2014 (Monheit, Cantor, DeLia & Belloff, 2011). This group has also lacked access to other private coverage. Most young adults are in good health, but many cannot afford primary care; an

unexpected health care need can cause health and financial problems (Kenney & Pelletier, 2008).

College students, as a group, tend to utilize medical services in a different manner than the general population. They have a tendency to delay treatment of illness until they have a convenient time, based on class schedule, and when they do seek treatment, they request immediate access to the service (Grace, 1997). Within this subculture, there are limited campus-based asthma care studies, and a question arises about how many SHCs are implementing systematic asthma management by utilizing national guideline recommendations.

In a. university study conducted by Reece, Holcroft, Faul, Quattrocchi, and Nicolosi (2002), the researchers reported continued concern regarding undiagnosed asthma and poorly controlled asthma among the student body. According to the study, even among the diagnosed asthma patients, there was evidence of inadequate asthma control; students tended to underestimate the severity of asthma, and were in denial about the seriousness of this illness. Furthermore, students diagnosed with asthma tended to see their lower level of functional health as "normal," and, as a result, they often failed to practice environmental control and other plans to manage their illness. Although the students had access to a SHC, many did not utilize this benefit, as indicated by the report that only 31% of students with severe asthma received their free influenza vaccine. This particular study also found a positive association between stress and asthma severity.

The impact of persistent asthma illness not only affects physical symptoms, but also causes emotional disturbance (Duplantier, 2005) and absenteeism (Duplantier, 2005; Milton, Whitehead, Holland, & Hamilton, 2004; Moonie, Sterling, Figgs, & Castro,

2008). Persistent asthma negatively impacts quality of life (Duplantier, 2005; Ford et al., 2003). Students' subjective symptom ratings are different from clinical objective findings, which suggest the importance of individualized educational interventions to meet the needs of specific students. A comprehensive explanation of asthma progress and treatment reduces uncertainty regarding the illness (Wolfe-Christensen, Isenberg, Mullins, Carpentier, & Almstrom, 2008).

A 2002 study indicated that severe asthma caused sleep disturbance, and a positive relationship was demonstrated between asthma severity and stress. Interestingly, this study also reported asthma severity did not affect the number of visits to University Health Services and thus indicated the importance of designing university asthma programs based on national asthma guidelines that consider the specific needs of young adults. The authors recommended partnerships between patients and clinicians as keys to successful asthma management in the university health center. (Reece, et al., 2002)

Although the campus population represents a cross section of society, it has at the same time a unique culture with pervasive stresses and coping mechanisms that cause many students to minimize illness symptoms and delay treatment. College health professionals are in a unique position to educate for health promotion and improved student health (Grace, 1997). If properly organized along national guidelines, patient education may be instrumental in improving asthma case management among students.

Project Sponsor and Key Stakeholders

This capstone project fulfills part of the requirements for the doctor of nursing practice (DNP) curriculum requirements. This author led the study as a full time advanced practice nurse (APN) employed at the SHC. This project served as a

continuous quality improvement (CQI) project for the SHC. There was no specific project sponsor; instead, this project was carried out as a collaborative effort with SHC leadership and staff. The CQI participants were SHC staff, but the main stakeholders were students with asthma.

Organizational Assessment

There were about 18,000 SHC visits during the 2010-2011 academic year. The SHC is situated within a cluster of wellness center services and shares facilities with campus recreation services and a counseling center. Student fees support the services offered by the student wellness cluster. The SHC is fully accredited by the Accreditation Association for Ambulatory Health Care, and it has a lab and pharmacy in house. Information technology staff provides services to the entire wellness cluster. The SHC also employs a care manager for referral follow-ups and patient assistance programs. The SHC provides sports medicine on a part-time basis, gynecological services for specific needs, and dermatology care by specialists. Appointments are based on same-day service. All students who pay the student health fee can utilize any clinic service, but the cost of procedures, labs, or medications are not covered. The available spirometry computer program was complex and not user friendly. No new spirometry equipment was purchased for this project. Each exam room had peak flow meters with disposable mouthpieces. The lab manager routinely cleaned the peak flow meter (PFM) with a bleach solution.

The mission of the SHC was to help students achieve their highest level of wellness and optimize their potential for academic success. The institution had established SHC goals and objectives that were aimed towards providing credible, cost-

effective healthcare through effective clinical services as well as excellent customer service to students. In pursuit of providing quality care, clinicians participated in continuing education activities, peer EMR reviews, and annual QI projects. The recent initiation of the asthma QI project added to the SHC's effort to provide evidence based health care delivery to the university students.

Implications of Asthma Management Guidelines

For the purposes of this capstone project, utilizing 2007 NAEPP EPR 3 was feasible and safe because the published national guideline recommendation was based on a stringent review of research studies. The national guidelines for accurate diagnosis, prescriptions for appropriate therapy, monitoring for disease control, and referrals to specialists as needed helped providers improve their patients' asthma control. In a survey program for clinical benchmarking of chronic care measures, ACHA recommended that health centers do chart reviews based on National Heart Lung and Blood Institute (NHLBI) guidelines, which addressed asthma care and documentation, measurement of airflow obstruction through peak flow or spirometry, provision of a patient action plan, and assessment of the effectiveness of controller medication (ACHA, 2009).

The practice environment affects adherence to the national guidelines for asthma. While providers generally perceived the guideline as useful, many reported a lack of tools to provide appropriate care except for peak flow meters and standard history forms (Tumiel-Berhalter & Watkins, 2006). A systematic implementation of the NAEPP EPR 3 practice guideline improved providers' prescribing of controller medications due to appropriate assessment of the severity of the illness in uncontrolled patients (Carlton, et al., 2005). Literature related to emergency department asthma protocol use indicated the

NIH-based protocols were effective in improving the quality of patient assessment and appropriateness of therapy, but the protocols were not effective in changing providers' prescribing habits (Self, et al., 2007). The protocol use was enhanced when ER staff followed a simplified form and received consistent reminders (Self, et al., 2007). An evaluation of asthma management in a public school that was based on the NHLBI guideline indicated poor adherence and lack of consistent strategies and needs for education and policy development (Snow, Larkin, Kimball, Iheagwara, & Ozuah, 2005). While evidence based practice (EBP) plays a part in improving care, there is a need for further evaluation of the strength, relevance, and sensitivity of the evidence based guideline in order to meet patients' unique needs and to safely practice (Nolan & Bradley, 2008).

NAEPP EPR 3

Beginning in 1991, the NAEPP of the NHLBI prepared guidelines for the diagnosis and management of asthma in order to bridge the gap of current knowledge and practice. The NAEPP released its latest updated EPR 3 in 2007, and it was based on current scientific evidence. Although asthma prevalence has increased over the years, the NAEPP reports that since it released its initial guideline, the number of deaths due to asthma has decreased, the incidence of activity limitations have decreased, and formal asthma education has increased. Due to the SHC population's age, this summary will focus on adult-related recommendations. The national guidelines focus on achieving and maintaining control of asthma so patients have a high quality of life and minimize lung function deterioration over time.

NAEPP EPR 3 has provided several updates to its recommendations. For example, accurate asthma diagnosis should be made through a thorough medical history, a physical examination to determine any recurrent episodes of airflow obstruction, use of spirometry in all patients ≥ 5 years of age to assess reversibility based on FEV1 measure and differential diagnosis to rule out other possibilities such as COPD or vocal cord dysfunction in adults. When the patient is not on preventive medication, the severity classification is used to guide initial therapy. The goal of asthma treatment and long-term management is to control the symptoms. Symptom control reduces impairment as manifested by reduced use of short acting beta agonist (SABA), maintenance of lung function, and ability to engage in normal daily activities. In addition, symptom control prevents exacerbations, minimizes hospital visits, prevents loss of lung function, and has, ideally, no or minimal adverse effects from medication therapy.

Under EPR 3, current impairment and future risk assessment have been added to the component of severity. The severity was simplified to intermittent or persistent; persistent was subdivided into mild, moderate, or severe asthma for youth ≥ 12 years of age and adults (see Figure 3). EPR 3 recommends inhaled corticosteroids (ICSs) for persistent asthma and a step up if needed after checking adherence, environmental control (See Figure 4), and comorbid conditions. The clinician will assess control (See Figure 5) and step down if possible when asthma is well controlled at least for three months (see Figure 6). Due to the recent safety data, long acting beta agonist (LABA) should not be used as monotherapy; omalizumab (Xolair) has been added to step 5 and 6 treatment consideration for this age group.

Asthma education is integrated into all aspects of patient care and is an ongoing partnership between the clinician and the patient. It is important to understand the patient's level of literacy and their cultural practices. Subjects for patient education include a written asthma action plan, education about self-monitoring to assess level of control, correct use of medications, avoidance of environment triggers, and the importance of influenza vaccine and treatment of comorbidity (NHLBI, 2010).

Components of severity		Classification of asthma severity (patients aged 12 y or older)			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment Normal FEV_1/FVC: 8-19 y 85% 20-39 y 80% 40-59 y 75% 60-80 y 70%	Symptoms	≤2 d/wk	>2 d/wk but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2 times/mo	3-4 times/mo	>1 time/wk but not nightly	Often 7 times/wk
	Short-acting β_2-agonist use for symptom control (not for prevention of EIB)	≤2 d/wk	>2 d/wk but not daily, and not >1 time/d	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extreme limitation
	Lung function	Normal FEV_1 between exacerbations FEV_1 >80% of predicted FEV_1/FVC normal	FEV_1 >80% of predicted FEV_1/FVC normal	FEV_1 >60% but <80% of predicted FEV_1/FVC reduced 5%	FEV_1 <60% of predicted FEV_1/FVC reduced >5%
Risk	Exacerbations requiring oral systemic corticosteroids	0-1/y[a]	≥2/y[a] →		
		← Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. →			
		Relative annual risks of exacerbations may be related to FEV_1			

[a] The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.

Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2-4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.

At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (eg, requiring urgent, unscheduled care; hospitalization; or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Figure 3. Classifying asthma severity and initiating treatment in youth ≥ 12 years of age and adults.

Uni

How To Control Things That Make Your Asthma Worse

The following allergens and irritants can worsen your asthma symptoms. Control your environment and avoid irritants to reduce asthma exacerbations. Appropriate treatment for allergy symptoms and periodic asthma medication review with your health care provider are important parts of asthma management. Please call the **Student Health Center** at **895-3370** if you have any questions.

Allergens

Animal Dander Some people are allergic to the flakes of skin or dried saliva from animals with fur or feathers.
The best thing to do:

- Keep furred or feathered pets out of your home.

If you can't keep the pet outdoors, then:

- Keep the pet out of your bedroom and other sleeping areas at all times, and keep the door closed.
- Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet away from fabric-covered furniture and carpets.

Dust Mites Many people with asthma are allergic to dust mites. Dust mites are tiny bugs that are found in every home-in mattresses, pillows, carpets, upholstered furniture, bedcovers, clothes, stuffed toys, and fabric or other fabric-covered items.

- Encase your mattress in a special dust-proof cover.
- Encase your pillow in a special dust-proof cover or wash the pillow each week in hot water. Water must be hotter than 130° F to kill the mites. Cold or warm water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.
- Reduce indoor humidity to below 60 percent (ideally between 30-50 percent). Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed or wash the toys weekly in hot water or cooler water with detergent and bleach.

Cockroaches: Many people with asthma are allergic to the dried droppings and remains of cockroaches.

- Keep food and garbage in closed containers. Never leave food out.
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.
- If a spray is used to kill roaches, stay out of the room until the odor goes away.

Indoor Mold

- Fix leaky faucets, pipes, or other sources of water that have mold around them.
- Clean moldy surfaces with a cleaner that has bleach in it.

Pollen and Outdoor Mold What to do during your allergy season (when pollen or mold spore counts are high):

- Try to keep your windows closed.
- Stay indoors with windows closed from late morning to afternoon, if you can. Pollen and some mold spore counts are highest at that time.

Irritants

Tobacco Smoke

- Consult your health care provider for information on smoking cessation programs at UNLV

Smoke, Strong Odors, and Sprays

- If possible, do not use a wood-burning stove, kerosene heater, or fireplace.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

Other things that bring on asthma symptoms in some people include:

Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you vacuum, use a dust mask (from a hardware store), a double-layered or microfilter vacuum cleaner bag, or a vacuum cleaner with a HEPA filter.

Other Things That Can Make Asthma Worse

- Sulfites in foods and beverages: Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other Medicines: Such as cold medicines, aspirin, vitamins and other supplements, and nonselective beta-blockers (including those in eye drops)

Adapted from NIH Publication No. 07-5251

Figure 4. EMR - Asthma triggers.

Components of control		Classification of asthma control (patients aged 12 y or older)		
		Well-controlled	Not well-controlled	Very poorly controlled
Impairment	Symptoms	≤2 d/wk	>2 d/wk	Throughout the day
	Nighttime awakenings	≤2 times/mo	1-3 times/wk	≥4 times/wk
	Interference with normal activity	None	Some limitation	Extreme limitation
	Short-acting β_2-agonist use for symptom control (not for prevention of EIB)	≤2 d/wk	>2 d/wk	Several times per day
	FEV_1 or peak flow	>80% of predicted/ personal best	60%-80% of predicted/personal best	<60% of predicted/ personal best
	Validated questionnaires ATAQ ACQ ACT	 0 ≤0.75[a] ≥20	 1-2 ≥1.5 16-19	 3-4 N/A ≤15
Risk	Exacerbations	0-1/y	≥2/y	
		Consider severity and interval since last exacerbation		
	Progressive loss of lung function	Evaluation requires long-term follow-up care		
	Treatment-related adverse effects	Adverse effects of medication can vary in intensity from none to very troublesome and worrisome. The level of intensity is not correlated with the level of control but should be considered in the overall assessment of risk.		

Criteria for well-controlled, not well-controlled, or very poorly controlled asthma in children aged 12 years or older. Level of control is based on the most severe impairment or risk category. Assessment of the impairment domain is based on the patient's (or caregiver's) recall of incidents during the previous 2 to 4 weeks and by spirometry or peak flow measures for patients aged 5 years or older. Symptom assessment over longer periods should reflect a global assessment, such as determining whether the patient's asthma is better or worse since the last visit. ACQ = Asthma Control Questionnaire; ACT = Asthma Control Test; ATAQ = Asthma Therapy Assessment Questionnaire; EIB = exercise-induced bronchospasm; FEV1 = forced expiratory volume in 1 second. ACQ values of 0.76-1.4 are inconclusive regarding well-controlled asthma. From Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma.

Figure 5: Assessing asthma control and adjusting therapy in youth ≥ 12 years of age and adults. Source: National Heart, Lung, and Blood Institute (2010, p. 270).

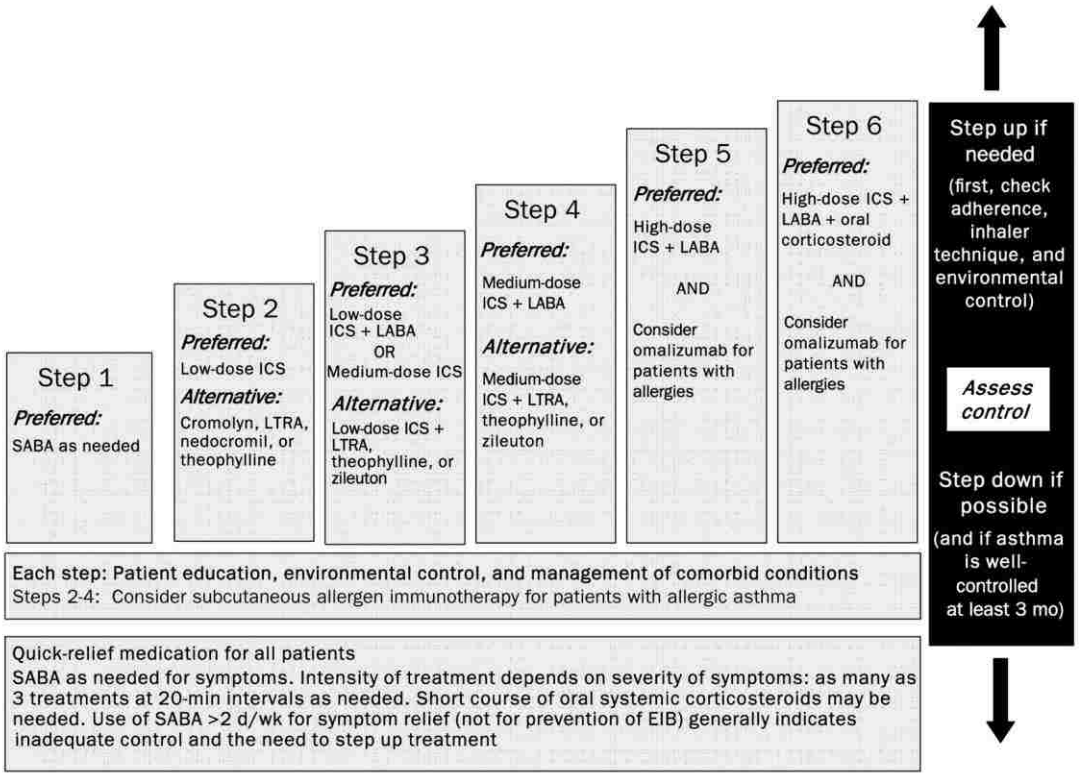


Figure 6. Stepwise approach for managing asthma in patients aged 12 years or older. EIB = exercise-induced bronchospasm; ICS = inhaled corticosteroid; LABA = long-acting β-agonist; LTRA = leukotriene receptor antagonist; SABA = short-acting β-agonist. From the National Heart, Lung, and Blood Institute (2010, p. 268), Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma.

Asthma Clinical Practice Guidelines NGC-5905 & AGREE Critique

The National Guideline Clearinghouse (NGC) helps clinicians evaluate the strength of national guideline recommendations. NGC-5905, "Measures of asthma assessment and monitoring: Expert panel report 3: guidelines for the diagnosis and management of asthma" is useful for developing clinical practice tools and education materials; and it provides a stepwise approach in management of asthma based on cumulative scientific evidence (see Appendix D). This guideline was valuable for the SHC as it initiated systematic implementation of national recommendations, and, as the

SHC adapted to the students' situations in order to improve compliance, it provided appropriate flexibility in implementation.

NGC-5905 clearly delineated intervention and practice considerations through diagnostic parameters, management/evaluation/risk assessment, and guidance for the major outcomes that needed to be considered. The guideline utilized a weighted rating scheme (Evidence A to D with A being the strongest) for the strength of the evidence based on the review of literature which included randomized controlled trials and a rich body of data findings. However, the NAEPP EPR 3 lacked formal cost analysis. Asthma control is defined by reduced impairment as a result of preventing chronic and troublesome symptoms, by infrequent SABA use (≤ 2 days a week), by maintenance of near or normal pulmonary function test (PFT) results, by maintenance of normal activity level that meets patient and families' expectations for asthma care (Evidence A). It is important to monitor pulmonary function periodically (Evidence B for extrapolation from clinical trials and Evidence C from observation studies). The frequency strength is helpful for the SHC, because performing PFT (spirometry) for every visit may not be feasible for students due to cost and time constraints (NGC, 2007). The recommendation for spirometry testing is one of the 23 parameters used in this project.

The 23 Parameters

The EMR reviews were done by evaluating sample records for presence, absence, or not applicable (NA) status of 23 parameters for asthma management (See Figure 2). A physician who was a former employee drafted the parameters; she performed the initial asthma EMR review utilizing this tool. The validity of these parameters has not been tested. Due to the limited time period for this capstone project and the SHC staff's

familiarity with these parameters, this author decided to use this existing tool with permission from the physician who designed it.

The parameters are divided into five categories based on the NAEPP EPR 3 recommendations. The categories are organized to correspond with the EMR documentation sequence of subjective and objective data, assessment and evaluation, which includes patient education and discharge instructions. The first and second categories are to obtain a thorough asthma related history and provide routine asthma care during the intake. It includes patient symptoms, known triggers, current medication list, observed triggers and resultant frequency of SABA use, home peak flow meter use, prior pulmonary function test status (PFT/Spirometry) and emergency room or hospitalization history. Intake medical assistant or nurse records the asthma control test (ACT) score. The third category is the physical exam that includes upper and lower airway, measurement of peak flow readings, pulse oximetry and documentation of patient response if SABA treatment was included. The fourth category is documentation of asthma diagnosis and asthma severity level. The last category focuses on patient education, specialty referral if necessary and, if present, treatment of comorbid conditions. For the purpose of this study, patient education includes an asthma action plan, appropriate use and monitoring of SABA and LABA, trigger control, and appropriate follow up intervals.

The parameters reflect the basic national guideline recommendations. This author recognizes it does not cover all the recommendations from NAEPP EPR 3. For example, parameters for influenza or pneumonia vaccines are not included. However, the SHC offers free influenza vaccines to all students. Clinicians when appropriate, especially for

the patients with persistent asthma, recommend pneumococcal vaccine. Pneumococcal vaccine is available at the SHC fir a reasonable cost. In addition, routine functional assessment with pulse oximetry for SaO2 percent for patients without asthma exacerbation is not necessary (NHLBI, 2010). Pulse oximetry can be useful for children who are not able to perform PFT or PEF < 40% of predicted. A serial pulse oximetry is useful during exacerbation and improvement of treatment (Evidence B). However, single pulse oximetry value has relatively little value (NGC, 2007). The 23 parameters will be revised to meet the needs of SHC, but as currently constructed provide guidance to evaluate asthma diagnosed EMRs for the early stage of CQI within the SHC.

Provider and Patient Barriers

Uncontrolled asthma can be a burden to patients, affecting their quality of life, result in decreased productivity from missed work/school (Dean, Calimlim, Kindermann, Khandker, & Tinkelman, 2009) and may also become a financial burden (Accordini et al., 2006). In a Spanish study, adult asthmatic patients were more likely to be sub-optimally controlled (71%) compared to children (53%), and patients who were managed by a specialist were better controlled than those managed by a general practitioner (Prieto et al., 2007). Achieving a controlled state is a challenge due to multiple barriers. One barrier is a discrepancy in symptom control definition between providers and patient. For example, a study (Green, 2010) of 1276 patients in an asthma control test (ACT) indicated providers considered asthma control at about 30%, where as 50% of the patients thought their symptoms were controlled.

Another barrier might be clinicians' limited adherence to National guidelines. Among providers who perceived the national guidelines as useful, there was improved

adherence to implementing spirometry, use of peak flow meters, patient assessment, action plans, severity assessment, and use of anti-inflammatory medications (Tumiel-Berhalter & Watkins, 2006).

The common provider barriers to effective asthma management are a lack of patient education, prescribing habits that rely on SABA when there is need for ICS (Elliott, 2006) and result in under treating persistent asthma (Moonie et al., 2005), over-estimate of control, inadequate follow up ,and lack of monitoring such as pulmonary function tests. Although prophylactic medication is used for persistent asthma and has been shown to reduce morbidity and mortality, adherence to anti-inflammatory medication was often <50% in United Kingdom (UK) studies (Elliott, 2006). One study indicated 88% of clinicians were aware of national asthma guidelines, but self-reported compliance ranged from 39% to 53% due to various barriers (Cabana, Rand, Becher, & Rubin, 2001).

The common patient barriers to care were literacy level, environmental triggers, support system, and economic concerns (Kallstrom, 2007). Bender and Bender (2005) reported additional barriers to care including concerns about drug safety and cost, beliefs that minimized the severity of asthma, and concerns about medication dependency. According to Green (2010), the common patient barriers in South Africa were failure to recognize disease chronicity, abuse of over-the-counter medications, noncompliance, inability to use delivery devices, fear of adverse events, and cost issues. The adult patient group's barriers to adherence to asthma treatment in the UK were similar to the South African findings (Elliot, 2006). In addition, it was noted that adults' noncompliance with an asthma management plan was related to "belief that the medication does not work or is

not necessary; sense of only intermittent need, inconvenience, cost of medication, dislike of provider, interference of life hassles, [and] distrust of medical establishment" (Elliott, 2006, p. 225). One study reported personality traits such as negative affectivity and impulsivity correlated negatively with asthma control (Axelsson et al., 2009), which reminds providers of the importance of individualized management.

Asthma Control Test (ACT)

NAEPP EPR 3 recommends patients utilize self- assessment tools to improve the accuracy of their perception of asthma control. Self-assessment questionnaires are useful tools that can be completed during the visit. Several self -assessment tools (i.e. Asthma therapy Assessment Questionnaire, Asthma Control Test, Asthma Control Questionnaire, Asthma Therapy Assessment Questionnaire, Asthma Control Test, Asthma Control Score) measure the impairment and the risk domains of asthma. Not all studies measure both impairment and risk domains. The ACT is a simple self-evaluated symptom assessment tool that can assist patients and providers to evaluate the state of both the impairment and the risk domain. The possible total score ranges from 5 to 25, and score of $\leq$ 19 indicates suboptimal control. ACT identifies area of quality of life, frequency of symptom, severity, frequency of SABA use and self-perceived asthma control. The ACT questionnaire is a valid, easy to use tool that provides evidence to support clinical decision-making (Halbert, Tinkelman, Globe, & Shao-Lee Lin, 2009; Ko et al., 2009). According to a study based in Japan, the ACT score predicted the risk of future exacerbation within one year (Sato et al., 2009). While FEV_1 is used as an indicator of asthma control during the pulmonary function test, studies indicated a positive correlation between the ACT score and FEV_1 (Ko et al., 2009; Leung et al., 2009). However,

NAEPP EPR 3 indicated currently available instruments have not had a standardized assessment for validity and reliability (NHLBI, 2010, p. 50). Although the ACT is not a comprehensive test, it complements other assessments obtained during the visit and the SHC staff members are familiar with this test and find it easy to score.

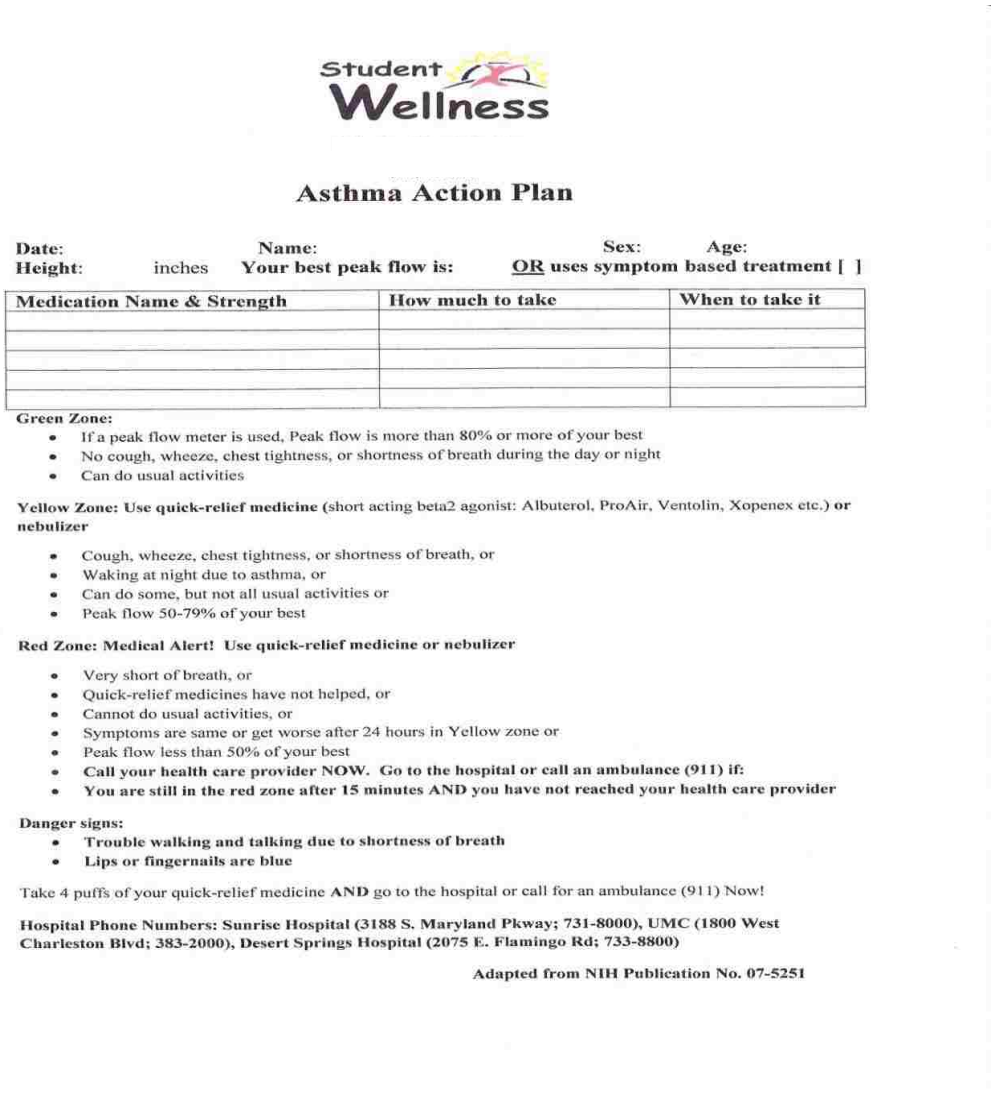
Peak Flow Monitoring vs. Symptom-Based Monitoring

The peak flow meter is a handheld device that measures forced expiratory volume. The evaluation is based on gender, age and height; depends on effort and technique; and is not considered a diagnostic tool (NHLBI, 2010), but it is useful for ongoing self-monitoring that may alter an asthma management plan. Long-term peak flow monitoring is recommended for moderate or severe persistent asthma (Evidence B), history of severe exacerbations, poorly perceived airflow obstruction, and worsening asthma. In addition, peak flow monitoring is important during asthma exacerbation (NHLBI, 2010). NAEPP recommends a written asthma action plan if peak flow is used. Written asthma action plans can be based on either symptoms or peak flow measurements (Evidence B, NHLBI, 2010, p. 94). Although students often reply they used a peak flow meter in the past, especially during childhood, they no longer have the device and do not know their personal best value. Even among the students with persistent asthma, it is challenging to monitor home peak flow daily. For that reason, the SHC providers often rely on the patients' reported symptoms and then monitor peak flow readings during the visit. Either peak flow or symptom monitoring may be equally effective if taught correctly (Evidence B), and either way, self-monitoring is important for self-management of asthma (Evidence A). NAEPP EPR 3 recommends the frequency of visits be up to the clinician based on the patient's symptom control status. For patients with intermittent and mild,

persistent asthma, symptom control should be undertaken for at least three months and appointments should be scheduled every six months. However, patients whose asthma symptoms are uncontrolled, and those patients whose symptoms are severely persistent need closer observation.

Asthma Action Plan

A written asthma action plan is recommended for all patients with asthma and it should include daily routines, which help the patient recognize worsening symptoms and effectiveness of disease management. This is especially important for patients with moderate to severe persistent symptoms, a history of severe exacerbation, or a history of poorly controlled asthma (Evidence B). Although there have been inconsistent studies regarding written asthma action plans, NAEPP EPR 3 recommends the use of a written asthma action plan that is suitable for the practice setting and a plan that is communicated in a patient education setting between patients and providers. The written asthma action plan (See Figure 7) should include the following information: short and long-term medications, actions to control environmental factors, recognition of worsening symptoms, how to respond to worsening symptoms, urgent medical care needs, and phone numbers for emergent situations. The written asthma action plan should be reviewed and updated during each visit (NHLBI, 2010).



Student Wellness

Asthma Action Plan

Date: **Name:** **Sex:** **Age:**
Height: inches **Your best peak flow is:** **OR uses symptom based treatment [ ]**

Medication Name & Strength	How much to take	When to take it

Green Zone:

- If a peak flow meter is used, Peak flow is more than 80% or more of your best
- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

Yellow Zone: Use quick-relief medicine (short acting beta2 agonist: Albuterol, ProAir, Ventolin, Xopenex etc.) **or nebulizer**

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all usual activities or
- Peak flow 50-79% of your best

Red Zone: Medical Alert! Use quick-relief medicine or nebulizer

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow zone or
- Peak flow less than 50% of your best
- **Call your health care provider NOW. Go to the hospital or call an ambulance (911) if:**
- **You are still in the red zone after 15 minutes AND you have not reached your health care provider**

Danger signs:

- **Trouble walking and talking due to shortness of breath**
- **Lips or fingernails are blue**

Take 4 puffs of your quick-relief medicine **AND** go to the hospital or call for an ambulance (911) Now!

Hospital Phone Numbers: Sunrise Hospital (3188 S. Maryland Pkway; 731-8000), UMC (1800 West Charleston Blvd; 383-2000), Desert Springs Hospital (2075 E. Flamingo Rd; 733-8800)

Adapted from NIH Publication No. 07-5251

Figure 7. EMR Asthma Care Action Plan.

Spirometry

Spirometry is a pulmonary function test which measures the volume and flow of air that is inhaled and exhaled in a given time period for children ≥5 years. Besides monitoring other chronic lung diseases, it is a useful diagnostic tool for asthma as well as a means to assess the severity of symptoms and measure reversibility after SABA treatment. The measurement indicates normal, obstructive, restrictive, and a combined

obstructive/restrictive pattern. The most often used measurements are forced expiratory volume in one second (FEV_1), forced expiratory volume in six seconds (FEV_6), forced vital capacity (FVC), and the proportion of the air blown out in one second to the total volume in one breath (FEV_1/FVC). FEV_1 is an important flow index for asthma control. A study that assessed the relationship between pulmonary function, bronchial hyper-responsiveness, and atopic dermatitis in children with stable asthma found children with stable asthma had lower lung function in all levels (intermittent or persistent) compared to children without asthma (Yang et al., 2006). Sato et al. (2009) searched for probability of future asthma exacerbation; their study assessed the usefulness of self-assessment along with an objective measure. Their findings indicated combining spirometry with the ACT score provided statistically significant predictions. Patients with an $FEV_1 \leq 91.8\%$ and an ACT score ≤ 23 were demonstrated to be at risk of exacerbation within one year (Sato et al., 2009).

The recommended frequency of spirometry by NAEPP EPR 3 is as follows: at the time of initial visit (Evidence C); after the symptom has been stabilized; during the exacerbation; and at least every one to two years subsequently to assess the maintenance of lung function (Evidence B). However, spirometry may be used more often depending on severity of symptoms and response to management (Evidence D). Lung function declines gradually starting in adulthood, but asthmatics have greater decline on average (Chiang & Hsu, 1997). Spirometry is helpful for observing lung function over time. The SHC providers recommended spirometry during the initial visit, to assess prognosis of illness, and at least once a year.

Patient Education

Asthma education improves patient compliance with medication (Delaronde, Peruccio, & Bauer, 2005) and improves the morbidity pattern (Mishra, Rao, & Padhi, 2005). One of the systematic research reviews for children reported school wide asthma education enhanced patient and school employee knowledge of asthma, but had less consistent positive health outcomes, possibly due to a lack of environmental control (Coffman, Cabana, & Yelin, 2009). This report recommended creatively disseminating self-management education programs as a partnership between patients and providers, which would be integrated into a comprehensive approach to medical care.

Clark and Partridge (2002) illustrated how surrounding the patient in an asthma management support system to strengthen asthma education could enhance disease control. The system included "Family Involvement, Clinical Expertise, Work/School Support, Community Awareness and Action, Community-wide Environmental Measures, Conducive Policies and Effective Business Practice" (Clark & Partridge, 2002, p. 1662). The system depicts the importance of provider involvement in patient centered education to achieve disease control.

Several other studies have investigated asthma education programs. A study of young adults in Finland indicated the degree of patient asthma education can be affected by childhood living conditions and economic adversities (Kestila et al., 2005). The researchers concluded that recognizing childhood experiences could play an important role in preventing health problems in adulthood. Another study found providing both audio and print educational materials enhanced patient adherence to medication (Schaffer & Tian, 2004). Accordingly, a written action plan such as the one in Figure 9 provides

the patient with knowledge on how to manage symptom exacerbation as well as how to cope with the disease day to day.

Student education should be a part of every routine visit. As illustrated in Appendix A, it may include teaching or reviewing correct medication use monitoring peak flow, planning asthma action planning, understanding the importance of annual influenza vaccination, controlling the environment, modifying life style (such as smoking cessation), and treating comorbidity (such as seasonal allergy symptom control).

Synthesis

Asthma is a chronic inflammatory airway illness affecting over 300 million people globally (WHO, 2006), and although the exact cause of asthma is unknown, genetic predisposition and environmental exposure are generally accepted as the main culprits. Uncontrolled asthma not only results in economic loss but also negatively affects quality of life and productivity. The university SHC manages asthma on a daily basis. Although asthma is not one of the top 10 diagnoses encountered at the SHC, providing evidence based care has been an ongoing effort. SHC providers are knowledgeable about the national asthma guideline recommendations, but it is challenging to comply with these recommendations due to student and provider barriers.

This project used 23 parameters extracted from NAEPP EPR 3 to compare the findings before and after staff interventions of two QI asthma diagnosis EMR reviews. While the tool has not been validated, it has served as an important tool to implement the initial phase of asthma CQI at the SHC. Due to the unique circumstances of student life, it is the SHC's intention to take every opportunity to educate students about asthma management and symptom control as it relates to their quality of life. NAEPP EPR 3 is a

set of well-known national guidelines the SHC can follow to diagnose and manage asthma. ACHA (2009) recommends SHCs to follow national guidelines in caring for students with asthma. NAEPP EPR 3 emphasizes accurate measurement of severity in order to initiate appropriate treatment and management by "step up" treatment for uncontrolled asthma, and "step down" treatment for well-controlled symptoms. NAEPP EPR 3 recommends ICS for initial persistent asthma treatment. All patients being treated for ICS need SABA, and they should be instructed appropriately in its use.

NGC- 5905 (NGC, 2007) is a concise critique resource for evidence based measures of asthma assessment and monitoring based on EPR 3. It evaluates the strength of guideline recommendations for asthma diagnosis and management. Periodic assessment measures such as ACT scoring, peak flow meter monitoring, spirometry and asthma care action plans assist students to objectively monitor symptoms and manage their care. As demonstrated in this project, CQI is a patient-centered process of executing a continuous flow of improvements as well as a motivation for staff to provide improved health care within an organization.

CHAPTER 3

THEORETICAL UNDERPINNINGS OF THE PROJECT

JHNEBP and Deming's PDSA Cycle

This project was guided by the framework from the John Hopkins Nursing Evidence Based Practice (JHNEBP) Model and Deming's Plan-Do-Study-Act (PDSA) cycle (Deming, 1993) as a model for CQI. With the understanding of an APN, the author based the foundation of this project on evidence based, systematic nursing knowledge. JHNEBP and the PDSA cycle complemented the CQI process. JHNEBP provided systematic guidance from identification of an EBP question to communication of the findings. In addition, the PDSA cycle was a feasible, simple, visible way to implement CQI for an organization where multidisciplinary staff members had a part in this project.

The JHNEBP was developed to help nurses understand and utilize the basic principles of evidence based practice for decision making in patient care. Its goal is to facilitate implementation of effective nursing interventions, efficient care, and improved outcomes for patients. The JHNEBP Model (Figure 8) utilizes a formalized process to develop a practice question, gather evidence through research findings, and develop an action plan to implement changes based on the findings (Newhouse, Dearholt, Poe, Pugh, & White, 2007).

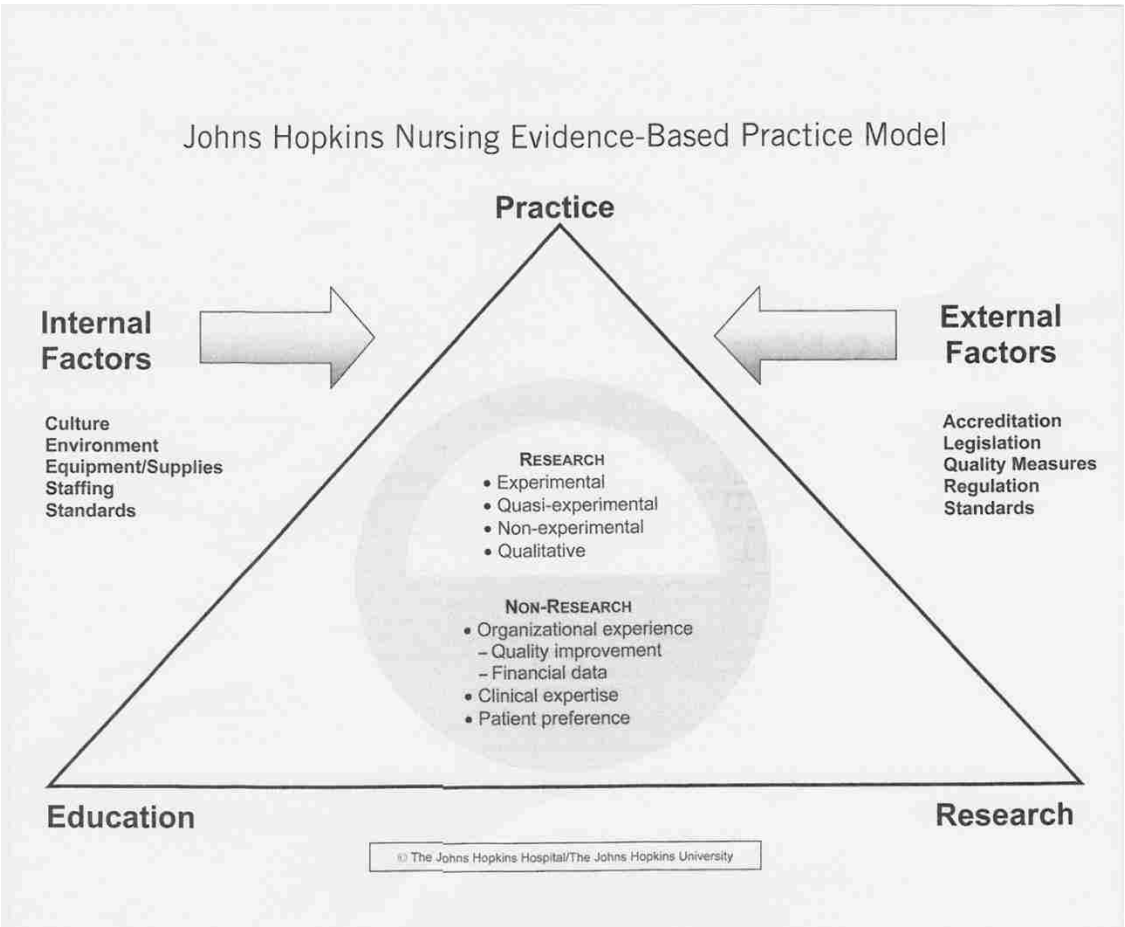


Figure 8. The Johns Hopkins Nursing Evidence-Based Practice Model (JHNEP). Copied with permission from the Institute for Johns Hopkins Nursing.

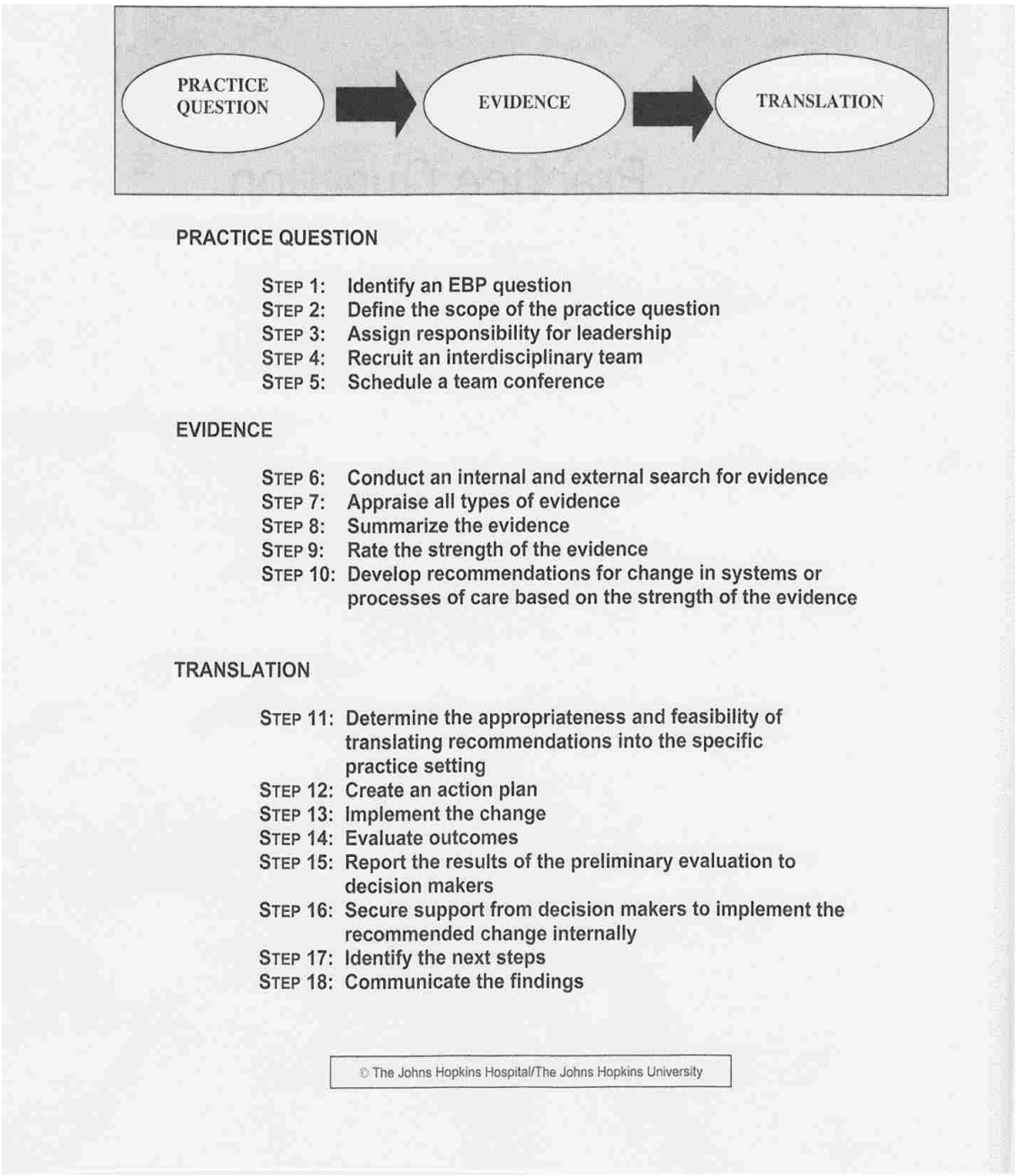


Figure 9. The Johns Hopkins Nursing Evidence-Based Practice Process. PET (Practice Question, Evidence, and Translation). Copied with permission from the Institute for Johns Hopkins Nursing.

In 18 steps arranged in three sets (Figure 9), this model guided the project systematically from conceptualization to conclusion. Using PET (practice question,

evidence, and translation) as a tool for quality improvement (QI) in the SHC treatment of asthma patients provided a pathway to document the use of EBP. This model is an open system that recognizes results of the project are influenced by input from both external and internal factors. The external factors, such as accreditation, quality measures (outcome and performance data), regulation, standards, and legislation, influence the system. Results are also influenced by internal factors: culture, environment, equipment/supplies (specifically peak flow meters and spirometry, electronic medical record systems, and nebulizer machines), and staffing levels required to provide efficient care and maintain high standards (Newhouse, et al, 2007).

The first five steps of the JHNEBP model are grouped under the practice question section. They helped determine the purpose and the scope of the project, and determine who would be carrying out the objectives. While "secure support from decision makers…" is listed as Step 16 in the translation phase of the project, support from the SHC director and leadership team was essential from the beginning. This support allowed the author to recruit SHC colleagues as project team members and receive departmental resources, including staff training time, in the project.

Steps six through ten involve the gathering of evidence as documented in the literature review. Internal evidence included previous QI findings on asthma treatment, and extensive external data, which included peer-reviewed studies, national guidelines such as NAEPP EPR 3, and clinical practice guideline (CPG) NGC 5905. An appraisal of guidelines for research and evaluation (AGREE) appraisal was used to validate the strength of NGC 5905. Based on internal and external evidence, a plan was presented to

the SHC director for improving asthma management with results to be evaluated in subsequent QI findings.

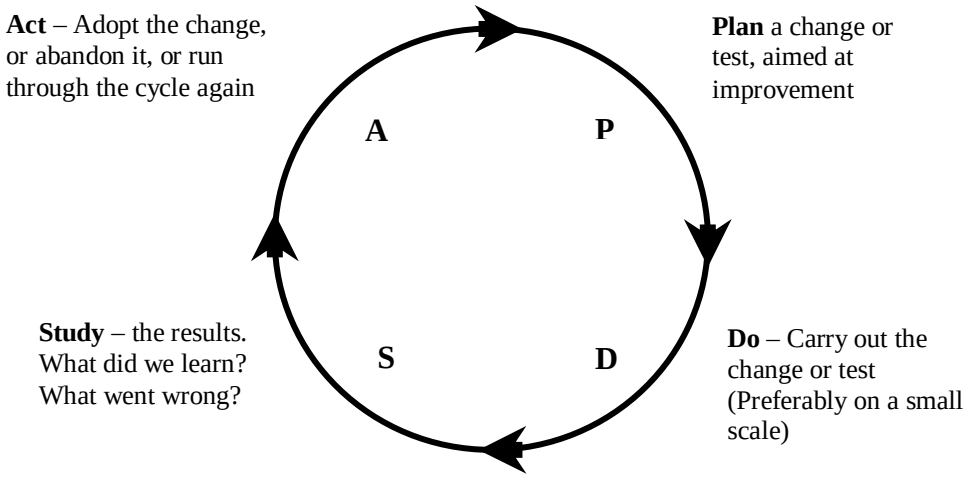
The remaining eight steps provided guidance for testing the practice question, then implementing and evaluating the effectiveness of the intervention. Positive outcomes from the intervention are presented to the SHC leadership for implementation as an ongoing policy. The final step in the JHNEBP model involves sharing the findings internally and making them available externally for further research.

CQI

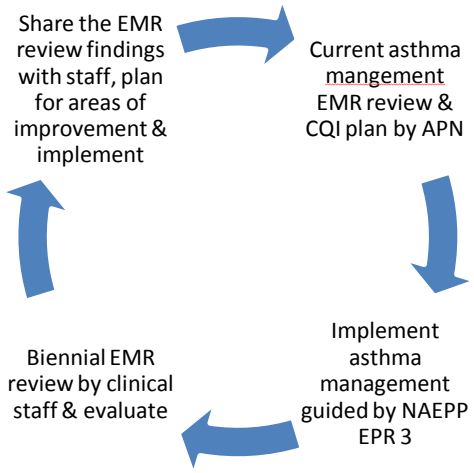
CQI is a patient-centered process within a particular organization supported by the organizational strategic plan. Its purpose is to provide quality health care that meets or exceeds expectations for executing a continuous flow of improvements. Since the Institute of Medicine (IOM) initiative to reduce medical error (IOM, 2001) was introduced, institutions have invested resources to reduce medical errors and thereby increase quality of care and patient safety (McLaughlin & Kaluzny, 2006). CQI does not happen quickly, but rather evolves over time. Management and employee buy-in is necessary for a successful outcome. For specific care-process improvement, staff training is necessary. Analysis and redesign of the product (if necessary) lead to implementation of a consistent policy that uses evidence based practice. CQI provides several benefits for health care management. It can help motivate staff to improve performance because there are objective metrics that can be measured to compare one year to another.

Deming's PDSA cycle is a dynamic four-step management method that has been used for CQI in many businesses and service arenas. It is sometimes known as the

Deming cycle, the Shewhart cycle or the plan-do-study-act (PDSA) cycle. In its basic form, PDSA is a four-step cycle for problem solving that includes: (1) Plan—a change or a test, aimed at improvement (2) Do—carry out the change or the test (preferably on a small scale); (3) Study--evaluate the result; and (4) Act—Adopt the change, or abandon it, or run through the cycle again (Deming, 1993). PDSA is a continuous process for learning and improvement based on the belief that knowledge and skills are limited, but, by repeatedly implementing the cycle of improvement, each cycle brings the organization closer to the goal of perfection (Moen & Norman, 2010). Study of the weak areas evidenced by comparing the 23 parameters to actual EMRs is part of the Planning cycle and indicated limited documentation of asthma treatment and inconsistent treatment. The Do cycle included staff training, checklists, and providing templates in the EMR for patient education. The Study cycle is accomplished during the annual EMR review with grading of the 23 QI parameters. The Act cycle involves institutionalization of successful processes introduced in the Do cycle (see Figure 10).



Deming's PDSA Cycle (Deming, 1993, p.132: Used with permission from The MIT Press, see Appendix G)



Adapted from Deming's PDSA Cycle (Deming, 1993: Used with permission from The W. Edwards Deming Institute)

Figure 10. Asthma CQI cycle based on Deming's PDSA.

The CQI is a collaborative process with many stakeholders from a variety of disciplines, but the focus must always be on the needs of the patient. Nursing staff encounter patients at the beginning, in the middle of the treatment process, and at the patient discharge stage. The nursing function is not limited to taking vital signs, but includes measurement of peak flow meter reading (PFM), obtaining an asthma control test (ACT) score and taking a history for current medications, including over the counter allergy or asthma medications. Nursing staff should be trained to perform accurate spirometry testing and patient education. The history Section includes documentation of the symptoms which a patient experiences, comorbidity and triggers, home monitoring, assessment of short acting beta agonist (SABA) frequency of use, past PFT and past medical history related to asthma exacerbation. The exam section includes upper and lower airway exam, peak flow reading/SaO_2 and documentation of post SABA treatment response. Because of their high level of patient contact, the professional nurse is a key player in CQI. The assessment section includes appropriate parameters for documentation of asthma type and level of severity. The last plan section includes documentation of an asthma action plan, patient education, referral when necessary, appropriate follow up visit intervals, comorbid management, environmental control, step up and down treatment plan and monitoring spirometry as part of PFT. This chart illustrates a typical primary care clinic asthma flow chart, which is self-explanatory (see Figure 11). CQI is a cyclical process in which all the stakeholders continually refine their parts in order to provide quality and safe patient care.

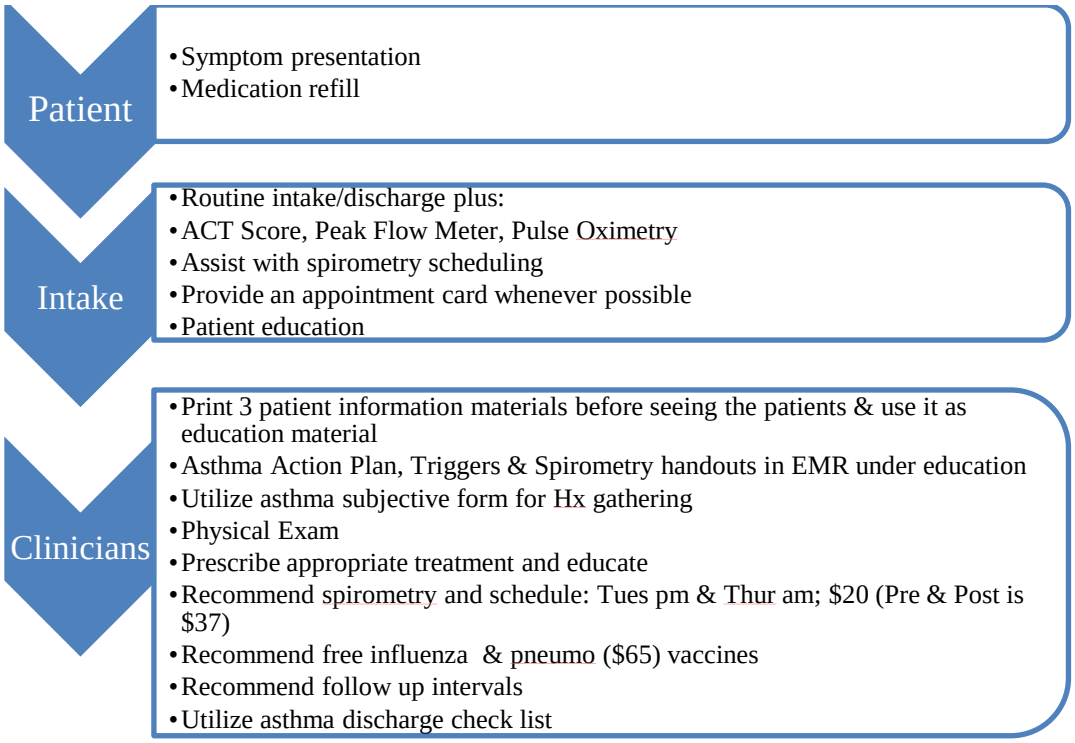


Figure 11. Asthma Management Flow Chart

CHAPTER 4

PROJECT AND EVALUATION PLAN

Background

Annual QI EMR reviews based on 23 QI parameters were conducted on asthmatic student EMRs at the SHC. For the purpose of this study, the same assessment tool was utilized. While the validity and reliability of this assessment tool has not been studied, these parameters closely parallel the 2007 NAEPP EPR 3 recommendations. The SHC has set a goal of meeting 90% satisfaction when it performs QI. During the 2009-2010 academic year QI EMR review, four parameters (listing of current medication, patient symptom, lung exam, having asthma diagnosis, and suggested follow up visits) met this expectation. Poor performance parameters were: taking prior PFT history, prior asthma related hospitalization history, documentation of SABA treatment response, severity of asthma diagnosis, written asthma action plan, recommendation of weaning off ICS for controlled asthma and follow up based on increased SABA usage. These findings are similar to the previous year's QI review. The asthma QI review results were presented to the staff with discussion about areas of improvement.

Since Fall 2010, staff education focused on those areas which needed improvement based on the previous year's QI. SHC resources for asthma management have improved with addition of a spirometry clinic offered two half days weekly. Providers now have access to asthma action plan templates. The providers at the SHC adopted parts of the national guidelines based on their knowledge and comfort level.

Throughout 2011, staff education on asthma care was implemented, and it was reinforced as an ongoing process. The author presented general asthma topics such as spirometry technique and interpretation, use of peak flow meter, measuring data, and

writing an asthma action care plan during staff and provider meetings. There were occasions a local allergy/asthma specialist presented asthma topics relevant in the past year. The specialist also provided additional educational sessions on spirometry interpretation. All providers received a copy of the NAEPP EPR 3 summary report booklet published by the National Institute of Health (NIH) at the beginning of 2011.

Project Plan

Setting and Population of Interest

The research setting is a SHC in an urban, public university with an enrollment greater than 25,000 students. During the 2009 – 2010 academic year there were approximately 19,000 clinic visits. This study includes EMR data only from those students who utilized the SHC for asthma related visits. The focused education is targeting SHC staff who provide care for these students.

Measures, Instruments, and Activities

Initially, all EMRs in the SHC database with asthma diagnosis during the two study periods were retrieved. Then EMRs with exercise-induced asthma (EIA) and patients younger than 18 years of age were excluded. Including EIA EMRs would add more variables to the study because exercise frequency could skew the data. Depending on the size of the pool, a systematic random formula was used to select records for evaluation such that 50 EMRs were selected for inclusion in the study. From the 2009-2010 academic year, 25 asthma EMRs were randomly selected for an in-house QI review. The limited number of records reflected constraints of available reviewer time to process the results. At the initiation of the project, 50 records were selected for each review with

the 2009-2010 QI results noted as a baseline. A post hoc power analysis suggested 50 EMRs were adequate for the analysis.

Utilizing the pre-existing asthma QI instrument, the author conducted two EMR quality reviews at the end of the spring and at the end of the fall semesters 2011. The SHC utilized these criteria for two previous annual asthma QI reviews and the staff was familiar with this instrument. A clinician who was not conducting this capstone project selected EMRs for review in order to reduce reviewer bias and avoid data bias. Throughout the period of the capstone study, the SHC staff received education and training on evidence based care for asthma management as noted in Table 1. The findings Fall 2011 were compared with the baseline QI results and with the Spring 2011 results.

Use of the pre-existing QI instrument tool permits consistent data comparison to determine if ongoing staff education has improved adherence to the national guidelines. This instrument does not contain copyright material. It was developed specifically to evaluate adherence to NIH guideline recommendations at the SHC.

Methods

This study used descriptive statistics (e.g., percentiles, frequencies, and correlations). The identified EMR parameters were initially evaluated as a symbol of the presence/absence of the criteria in the QI flow sheet (see Figure 12). Once the 50 EMRs were evaluated, each criterion (23) was calculated as a percentage of positive findings by using the Statistical Package for the Social Sciences (SPSS) version 17 (Cronk, 2008) for frequency distributions and percentile ranks. The difference between the before (i.e., both the baseline and the Spring 2011) and after (i.e., Fall 2011) percentile scores were

compared in terms of statistical significance in order to evaluate the effect of the instructional intervention. These findings were also compared with the previous school year's QI findings in a frequency table. The after percentile scores are hypothesized to be higher than the before scores, thereby providing evidence to support the effectiveness of the instructional intervention. Recommendations were drawn from these data. A simple nominal frequency scale was used for comparison of the total number of spirometry tests per number of asthma records for each study period.

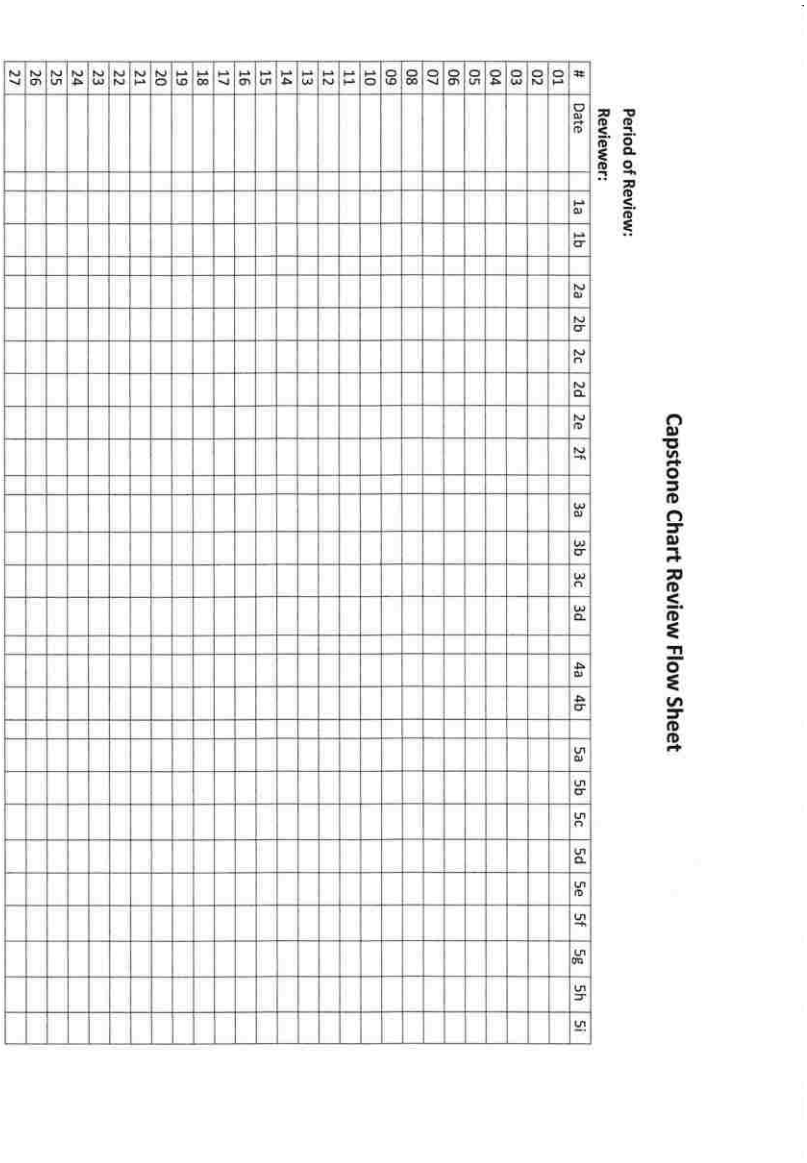


Figure 12. SHC QI flow sheet. Used with the permission from Pamela Gross, MD, PhD (Personal communication, November 30, 2010)

Table 1.

Detailed Project Timeline

Time period	Activities	Date completed
Spring semester 2011	Contact NIH and obtain asthma topic related free resource materials	January 5, 2011
	Distribute provider resources for 2007 NAEPP EPR 3	January 21, 2011
	Provider meeting presentation on SOAP note template based on QI parameters, introduce purpose of this DNP capstone project	January 21, 2011
	Review EPR 3 highlights during March provider meeting	March 18, 2011
Summer session 2011	After IRB approval, initiate EMR review: Retrieve and review 50 random EMR for the period of 15 May 2010 to 14 May 2011 with asthma diagnosis	June 2011
	Schedule for a clinical staff in-service: General asthma topic and how we are managing asthma at SHC	June 2011
	Provide SHC staff (providers, nursing staff, IT and pharmacist) with feedback regarding asthma SOAP note use and evidence of students receiving ongoing medication education by pharmacist and providers.	July 2011
	Asthma education material placed in EMR	August 2011
	The QI report based on data from the May 2011 records briefed to the staff, with a focus on areas of improvement	August 2011
Fall Semester 2011	Ongoing refresher training, reminder notes handed out	September-December 2011
	Retrieve and review 50 random EMR with asthma (May 2011 to December 2011) diagnosis and perform QI based on the existing SHC parameters	December 2011
Spring Semester 2012	The author starts data analysis process by comparing QI findings from previous data	January 2012
	Complete data analysis and start evaluation process	February 2012
	Complete capstone project writing and submit to appropriate authority	March 2012
	Present capstone findings to SHC staff	March 2012

Spirometry Patient Information

What is spirometry?
Spirometry is a pulmonary function test that measures the function of your lungs. A spirometer is a device that measures the flow and volume of air entering and leaving the lungs. A computer compares your test results with predicted normal values, based on your gender, height, age, and ethnicity.

When is spirometry used?
Spirometry is an integral tool to diagnose and monitor certain types of lung disease, such as asthma, chronic bronchitis, emphysema, pulmonary fibrosis, or chronic obstructive pulmonary disease. At the Student Health Center, spirometry is predominantly used to confirm the diagnosis of asthma, to assess efficacy of asthma treatments, and to monitor any changes in lung function.

How do you prepare for spirometry?
1)Schedule a SHC appointment at the Student Wellness front desk for spirometry or call 895-3370.

2) Avoid the following items for the time listed prior to spirometry:

- Vigorous exercise within ½ hour
- Heavy meal within ½ hour
- Short-acting rescue inhaler within 4-8 hours [e.g., albuterol (Ventolin®, Proventil®), levalbuterol (Xopenex®), pirbuterol (Maxair®)]
  NOTE: Do not hesitate to use your rescue Inhaler if needed.
- Anticholinergics within 6 hours (e.g., Atrovent®)
- Long-acting bronchodilator inhaler within 12 hours (e.g., Serevent®, Advair®)
- Leukotriene antagonists within 24 hours (e.g., Singulair®, Accolate®, Zyflo®)
- Oral bronchodilators within 24 hours (e.g., albuterol)
- Long-acting theophylline products within 36-48 hrs (e.g., Theo-24®, Theochron®)

3) Bring a list of the medications you are currently taking and the times you last took them to your spirometry appointment.

4) Bring your rescue inhaler (e.g., albuterol) to your spirometry appointment.

Who performs the spirometry and where?
Spirometry is performed by a nurse or medical assistant who has successfully completed spirometry training. Check in for your spirometry appointment at the front desk on the 1st floor of SHC.

What are the risks of spirometry?
The risk is minimal for most people. Because spirometry involves forced and rapid breathing, some people may experience temporary shortness of breath. Spirometry should not be performed if you have had any recent heart problems, abdominal surgery, fractured ribs, clot in the lungs, or severe trauma.

What happens during the test?
Spirometry is not painful but does require that you cooperate fully and provide the best effort possible to produce accurate results. You will be coached by the nurse to perform a number of breathing measurements. The breathing measurements are similar to blowing out birthday candles on a cake and breathing in and out as fast as you can. You will be breathing through a mouthpiece with a soft nose clip in place. You will be asked to complete at least three satisfactory measurements. You will have an opportunity to rest between measurements. You may be asked to inhale a short-acting medication that opens up your airways (e.g., albuterol). Spirometry testing takes from 30 to 60 minutes.

What happens after spirometry?
We recommend you schedule a follow-up appointment with your SHC provider within 2 weeks after the test. Your spirometry results will be sent to your SHC provider who will interpret the results and discuss the results of your test with you at your next appointment. You may resume your normal diet, activity, and medications following spirometry.

What is the cost of spirometry?
The SHC charge is substantially discounted from community rates. Please ask a staff member for the current cost. If you have the University-sponsored Student Health Insurance, spirometry is covered 80%.

If you have questions or would like to schedule or reschedule your appointment, call **895-3370**

Figure 13. EMR – Spirometry. Adapted and used with permission from University of North Carolina, Chapel Hill, Campus Health Services (Personal communication, May 19, 2011).

Measurement of FEV1 when

- A periodic check on the peak flow meter accuracy
- Precision is desired when evaluating response to treatment or diagnosing
- When peak flow results are unreliable, spirometry provides a quality check

Frequency of spirometry according to NAEPP EPR 3

- At the time of initial assessment (Evidence C)
- After treatment is initiated, and symptoms and PEF have stabilized, to document attainment of near normal airway function
- During a period of progressive or prolonged loss of asthma control
- At least every 1-2 years to assess the maintenance of airway function (Evidence B, extrapolation from clinical trials)
- More often than every 1-2 years, depending on the clinical severity and response to management (Evidence D)

Classification of asthma severity based on lung function

		Persistent	
Intermittent	Mild	Moderate	Severe
• Normal FEV1 between exacerbations • FEV1 >80% predicted • FEV1/FVC normal	• FEV1 >80% predicted • FEV1/FVC normal	• FEV1>60% but <80% predicted • FEV1/FVC reduced 5%	• FEV1 <60% predicted • FEV1/FVC reduced >5%

Figure 14. Spirometry in-service for clinicians. Source: National Heart, Lung, and Blood Institute. (2007, pp. 43, 269). *National asthma education and prevention program expert panel report 3: Guidelines for the diagnosis and management of asthma*. Bethesda, MD: National Institute of Health. National Heart, Lung and Blood Institute.

As noted in Table 1, focused education and training activities for this project began during the Spring semester, 2011. General asthma topics were presented, both formally and informally, and clinicians received an NIH published (2007) summary of NAEPP EPR 3 along with a summary highlights prepared by this author. Free asthma related resource materials were obtained from the NIH and distributed to clinicians. At a clinician meeting, the purpose of this DNP capstone project was introduced, and the author presented a SOAP note template (see Figure 1) based on the QI parameters. During a March clinician meeting the author reviewed NAEPP EPR 3 highlights.

At the beginning of Summer session, 2011, 50 EMRs were randomly selected from eligible records for the period of May 15, 2010 to May 15, 2011 for the Spring 2011 data review. The author led in-service staff training events in June, July, and August 2011. The training provided SHC staff (clinicians, nursing staff, IT and pharmacist) with general asthma knowledge, feedback regarding asthma SOAP note use and team roles in student medication education by the pharmacist and the clinicians. During the August in-service, the Spring 2011 records review was briefed to the staff, with a focus on needed areas of improvement in asthma management. Also in August, in coordination with IT, an Asthma SOAP note template, an asthma care action plan, spirometry information handouts, and patient discharge education materials were placed in the EMR system (see Figures 5, 7, and 13).

During the Fall semester, 2011, ongoing refresher training was provided to the staff, and occasional handouts served as reminders of asthma best practices. Numerous attempts were made during this period to correct software and hardware problems with the spirometry equipment, which were not resolved until the end of December 2011. At

the end of this semester, 50 EMRs were randomly selected from eligible records for the period of May 16, 2011 to December 16, 2011 for the Fall 2011 data review. This concluded the study period of this project.

During January of the Spring semester, 2012, the author received the raw data from the clinician performing the data review and started the data analysis process by comparing the Fall 2011 findings with the earlier results from the Spring 2011 review and the baseline QI from 2010. In March 2012, the completed project was submitted to a faculty committee for approval. In April, the project results were briefed to the SHC staff with emphasis on continuous quality improvement.

Project Tasks and Personnel

Staff Education

There were several staff asthma educational opportunities offered by the author, and, a local allergy/asthma physician made presentations on asthma and spirometry topics during Spring and Summer 2011. The staff education topic included general asthma topics, medications, correct inhaler use, general spirometry information for staff, and spirometry interpretations for providers (See Appendices A, B, and C; and Figure 14).

Projected Staff Education Topics

At the beginning of the project, the author selected focused staff education topics based on weakness demonstrated in previous years SHC asthma QIs. These topics were briefed in detail to the staff beginning with an in-service during the Spring semester 2011 and continuing through the Summer semester 2011. The first topic was NAEPP EPR 3 highlights review for youth ≥ 12 years of age and adults. This class emphasized classifying asthma severity and initiating steps for treatment, discussing a stepwise

approach for managing asthma, assessing asthma control, adjusting therapy, and understanding the usual dosages for long-term control medications.

Another topic was the asthma care action plan. Clinicians were encouraged to discuss with students an asthma care action plan as part of assisting students with self-management. Providers were trained in the use of the care plan template provided by NIH (See Figure 7). The care plan included utilizing peak flow meters and symptom monitoring. This NIH action plan was simple to use and included patient information material on the back.

Spirometry was a topic for ongoing training with material specific to clinicians and the staff administering the spirometry tests. The clinician training focused on the importance of spirometry data for asthma management. For the staff who performed spirometry there was a need for continued training in the basic use of the equipment as there were several changes in personnel during this period.

Clinician-specific topics included a sample SOAP documentation based on QI parameters and training in how to use the electronic SOAP template. See Figure 1 for a sample SOAP note. Hard copy patient education materials were available for each provider and included the NIH Asthma Action Plan form, which includes environmental control information, along with spirometry, peak flow meter, and inhaler use technique. These hard copies were available until IT replaced them with a template in the EMR during Summer session, 2011.

Resources and Support

The SHC provided the essential resources and support for this project. The SHC director provided meeting space and designated staff time during the workweek for

training events. With SHC institutional authorization and IRB exemption, the project had access to EMRs for data analysis. Pre-existing spirometry equipment was utilized. IT resources were utilized to place asthma templates in the EMR system.

Sustainability of the Proposed Project

No marketing or additional financial needs were involved for this project. The author provided staff education as part of the SHC professional development in-service training.

Plans for Maintaining/Sustaining the Change

Findings from the last EMR review were the basis for the next staff education topic. During the summer sessions when there are fewer SHC daily patient visits, this author gave staff training sessions, which included a power point review of the capstone project. Clinician focused issues for ordering spirometry and medication were presented during one of the monthly clinician meetings. Annual QI EMR review is ongoing. Collaboration with the SHC care manager, IT, leadership and pharmacist were necessary.

Agency and IRB Approval

Statement of Mutual Agreement with Agency, Site, and Mentor

On February 15, 2011, the UNLV SHC institutional authorization to conduct research was provided (see Appendix E), and permission to use the Johns Hopkins Hospital/ The Johns Hopkins University JHNEBP Model PET process was obtained (see Appendix F). The permission to use Deming's PDSA cycle model is noted in Appendix G. The project was reviewed by the UNLV Office of Research Integrity—Human Subjects and deemed exempt as noted in Appendix H. Verbal and private email

permission was obtained from Pamela Gross, MD, Ph.D. for the SHC QI parameter use. The SHC director has a copy of the private email, which is available upon request.

IRB Approval or Exemptions as Appropriate

This study was deemed exempt from the institutional review board under 45 CFR 46.101(b) 4. See Appendix H.

CHAPTER 5

SUMMARY OF IMPLEMENTATION AND RESULTS

Initiation of the Project

Upon approval of the project by the capstone committee chair, and supported by the SHC director, staff education was planned and carried out as scheduled. Nursing staff practiced spirometry testing during clinic slow time. Due to staff time constraints and the complexity of the current spirometry equipment, the testing was not offered during the initial patient visit, but was scheduled during two half days set aside in the week for spirometry testing. Nursing staff recognized their role in asthma care during the intake and clinicians had necessary information for the EMR review parameters and 2007 NAEPP EPR 3 guidelines. A clinician who is not part of this capstone project evaluated the initial 50 EMR review (Spring 2011: 5/15/2010-5/15/2011) based on the 23 parameters used in the previous year's asthma QI. The author and a research assistant evaluated initial data analysis and subsequent staff education concentrated on the poorly scored parameters. A patient information and asthma template was loaded into the EMR during the fall 2011 semester. Ongoing clinical staff reinforcement was provided by reminder sheets (see Figure 15), such as where the patient education templates were located in the EMR, and by sample asthma SOAP notes. The second EMR review was performed by the same clinician after the fall semester 2011ended (half the length of time compared to the period of the previous study).

Where are the asthma templates?

Subjective and **Discharge** Instructions (just select& check off) created in EMR templates.

Educational Bulletins created under the following transaction codes:

AsthmaAcPl = Asthma Action Plan Draft
AsthmaTrig = Asthma Triggers
SpirPtInfo = Spirometry Patient Info

Asthma Subjective

Current medication:
Symptoms patient experiences:
Frequency of rescue inhaler use:
Symptom triggers:
Home **Peak Flow Meter** use OR Sx Mangt:
Spirometry status: Year:
ER visits/ hospitalization/Intubation History

Asthma Discharge Template

Patient educated regarding:
Control external/environmental triggers
Appropriate use of medication
Monitor frequency of rescue medication
Follow up sooner if increased rescue medication use (e.g. more than 2x/week)
New symptoms (e.g. nighttime awakening)
Spirometry testing every 1-2 years
Consider tapering steroid inhaler if symptoms controlled for 3 months
Schedule for spirometry without bronchodilator
Schedule for spirometry pre and post bronchodilator
Patient verbalized understanding of education
Patient exited in stable condition

Patient aware to follow up if further concerns

Figure 15. Patient handout reminder for staff.

Threats and Barriers to the Project

Although this is still the initial stage of a formal ongoing CQI process for asthma at the SHC, this author recognizes several threats and barriers to this study. The first threat to this study is that the 23 parameter tool was not tested for reliability or validity. The 23 parameters were drawn from the 2007 NAEPP EPR 3 guidelines, and the

presence of documentation in the EMR to support a particular parameter is assumed to indicate the national guidelines were being followed in that a given appointment.

Another limitation of this study was the small number (*n*=25) of cases in the QI that was used as a baseline. In order to compare the previous QI findings with the data from the two capstone periods, which had 50 EMRs each, the author had to impute data as if the baseline data were missing 25 cases. Imputing this number of cases may result in biased estimates. Follow-up studies should be adequately powered. Also, there may be a difference in subjective evaluation of raters. The EMRs from the baseline QI were reviewed by the author and the two capstone project EMR reviews were performed by a different clinician. The lower scores on certain parameters such as 5a, 5c, and 5d from the baseline QI to the first capstone EMR review may be due to reviewer judgment variances or extraneous variations such as clinician performance variability rather than the asthma education effect.

A barrier encountered during the EMR review periods was significant SHC staff turbulence due to the departure of the long-standing director and three nursing staff members, including one of the most proficient spirometry test administrators. In addition, during the time period of the project, the SHC went through an unexpected construction process that altered patient care rooms week by week. The IT person was tied up installing basic EMR required programs into different parts of the building, which delayed the inclusion of the asthma education materials into the EMR until the fall semester.

It should be noted that the pre-existing spirometry equipment was quite user-unfriendly and technically challenging, and the SHC was not able to purchase new

equipment due to limited funding during this period. Following the loss of three nursing staff members, the nursing staff positions were vacant and the remaining staff had to carry out their daily duties with less help. At the same time, the spirometry equipment had technical issues and could not be used during most of the second study period.

Monitoring of the Project

The author coordinated with the SHC director on staff education opportunities to ensure asthma education experiences complied with the project plan. Over the course of the project, additional handouts and informal conversation with staff were used to encourage application of the national guidelines in asthma management. To ensure impartiality, a clinician in the SHC who was not directly involved in the capstone project was asked to perform the random selection and scoring of the EMRs. Near the end of the first period of project data collection (5/15/2010 to 5/15/2011), the author spent several hours with the clinician who later analyzed the data (the data reviewer) to demonstrate how the baseline QI data was gathered and how the 23 parameters were scored. The author chose to compare random sets of 50 EMRs to compare the effectiveness of ongoing staff education.

The post hoc power analysis suggested that 50 was an adequate number of EMRs for data analysis. The data reviewer found 213 EMRs with asthma diagnosis and chose every fourth record to arrive at the 50 EMRs necessary for review. After scoring, the raw data, without patient identification, was presented to the author for statistical analysis. At the end of the second period of the project data collection (5/16/2011 to 12/16/2011), the data reviewer found 91 EMRs with asthma diagnosis, chose every other record, then returned to the unselected records and chose every other record until 50 EMRs were

chosen. There were fewer records to choose from because the second period was shorter and did not include the spring semester.

Two aspects of the project fell behind schedule due to external factors. During the summer semester of 2011, the asthma templates were scheduled to be placed on the EMR system, but the IT office experienced employee turnover and a sharp increase in workload. Eventually, negotiation aided by the SHC director gave the capstone project a higher priority from IT and resulted in only a one-month delay and minimal effect on the project. The other project delay was related to the in-house spirometry testing. Throughout the second data collection period of the project, the spirometry equipment experienced hardware and software computer problems, and there was a turnover in nursing personnel resulting in a shortage of staff trained to use the equipment. These problems were not resolved until the conclusion of the project data collection. However, the effect on patient outcome resulting from the lack of in-house spirometry support is beyond the scope of this capstone project. The data collection phase of the EMR review for this capstone project concluded at the end of Fall semester 2011. Data evaluation was completed in January 2012, and the statistical analysis was completed in March, 2012.

Data Analysis

Data were first tested for requisite assumptions, including univariate normality (Skewness and Kurtosis) because repeated measures designs are particularly susceptible to deviations of normality. The data approximated a normal distribution across all three time points—Skewness and kurtosis values $<|1|$. Additionally, the data were screened for univariate outliers. No outliers were detected. Additional testing procedures detected several cases with missing data for the EMR review at baseline in the sample using IBM

SPSS 19. The missing value analysis demonstrated 25 cases in the baseline EMR review were treated as missing data to facilitate comparison with the other data reviews. The intention to treat (ITT) analysis was utilized as the method for imputation of missing data, as the data under consideration were dependent rather than independent—as in between-subjects analyses. The ITT analysis is similar to imputation methods used in analyses with independent data insofar as it minimizes the introduction of bias in missing data imputation (Streiner, 2002). In this procedure, the participants' score prior to attrition was carried forward (i.e., last known observation is carried forward). Therefore, 50 cases were available for analysis for all three EMR reviews across time.

A repeated measures analysis of variance (RM ANOVA) was conducted on the three EMR reviews (Spring 2009-2010; Spring 2010-2011; Fall 2011) in order to examine the effectiveness of the teaching intervention as demonstrated in a review of parameters based on 2007 NAEPP EPR 3 recommendation for asthma patients across time. However, because the data violated the assumption of sphericity (Mauchly's W = .81, χ^2 (2, N = 50) = 10.25, $p < .01$), the multivariate results of the within-subjects main effect were interpreted in lieu of the univariate RM ANOVA results. Fisher's Protected *t*-test analyses were conducted to evaluate all possible pairwise comparisons of within-subjects means. Fisher's test corrects for familywise Type I error rate inflation via the Bonferroni adjustment to the *p*-value (.05/3 within-subjects pairwise comparisons = .016), due to the three unique within-subjects pairwise comparisons.

Data across all three EMR reviews were coded as 1 = Yes and 0 = No for each of the 23 parameters of the chart review. A "yes" indicated the parameter in question was covered in the asthma patient consultation whereas a "no" indicated the parameter was

not covered. All not applicable responses were coded as 0, so as not to influence the means. A summative score was subsequently obtained for all three EMR reviews by adding all dimensions across charts, thus yielding a composite sum score with a possible range from 0-23 per chart review. Therefore, a higher EMR score suggested the parameters were appropriately covered with patients during consultations, whereas a lower score suggested that not all parameters were appropriately covered, if at all.

Results

In order to ascertain differences in EMR reviews across the various semesters, an RM ANOVA was conducted. In this analysis, data collection points served as the independent variable and the EMR summative score served as the dependent variable. The results demonstrated the change from EMR reviews across semesters was statistically significant as indicated in Table 2. The Fall 2011 EMR reviews (M = 15.12, SD = 4.34) demonstrate a higher EMR score than the EMR 2009-2010 reviews (M = 13.12, SD = 2.54) as well as the EMR Spring 2011 reviews (M = 11.84, SD = 3.27). Post-hoc tests of within-subjects contrasts suggested the changes in EMR score between Spring 2009-2010, Spring 2011and Fall 2011 were statistically significant as demonstrated by the Cohen's d values. This suggests the proposed training was effective for improving overall evidence based practice with respect to asthma care.

Table 2.

The Changes from EMR Reviews Across Semesters

Multivariate $F = 9.37$, $p < 0.0005$, $\eta^2_p = 0.28$, Wilk's $\lambda = 0.72$	
Spring 2009-2010	$M = 13.12$, $SD = 2.54$
Spring 2010-2011	$M = 11.84$, $SD = 3.27$
Fall 2011	$M = 15.12$, $SD = 4.34$

Post-hoc tests of within-subjects contrasts the change in EMR score	
Spring 2009-2010 / Spring 2010- 2011	$t = 2.54$, $p = 0.01$, *Cohen's d* = 0.44
Spring 2009-2010 / Fall 2011	$t = -2.90$, $p < 0.01$, *Cohen's d* = -0.56
Spring 2010-2011 / Fall 2011	$t = -4.33$, $p < 0.0005$, *Cohen's d* = -0.85

Giving Meaning to the Data

National guideline-based staff education was an effective method to improve evidence based asthma management at the SHC. Although not all parameters reached 90%, the SHC goal for QI, the statistical analysis indicated significant improvement in most of the 23 parameters. See Table 3 for the three period frequency comparisons. While the baseline QI was not as statistically strong as the Spring and Fall 2011 QI review performed during this project, it established the need for this project and served as a guide for planning education topics for staff improvement in asthma management.

By the Fall 2011 period, the parameters that met the SHC 90% goal were current medication list, current symptoms, frequency of rescue inhaler use, physical exam for lungs, asthma diagnosis, and follow up interval. The other areas did not meet the 90%

cut off, but with the exception of documentation of patient response after nebulizer treatment, showed significant improvement compared to previous studies. The areas that scored below 70% were indication of home peak flow use, prior PFT status, past hospitalization history for asthma, patient response after nebulizer treatment, level of asthma, written asthma action plan, controller medication, and recommendation of direct follow up based on rescue inhaler use.

Among the parameters, which did not reach 70%, there were significant improvements from the baseline. Indicated use of home peak flow meter use improved from zero to 48%; prior PFT status increased from 32% to 42%; obtained medical history of previous emergency room visit or hospitalization increased from 32% to 60%; asthma level documentation increased from 24% to 50%; and asthma action plan went from zero to 54%.

The author did not consider as "low performance areas" the parameters such as administration of albuterol nebulizer treatment and documented response (3d); referral to specialty (5f); and wean off unnecessary controller medication (5h). In these lowest scored parameters, the documented responses may be a reflection of tool limitations. For example, not all 50 EMRs had nebulizer treatment, but the EMR evaluator noted presence (yes) or absence (no) of patient response after the treatment for those who received treatment. The EMR evaluator entered "not applicable" (N/A) for records without nebulizer treatment, but for statistical purposes, N/A and "no" were both coded 0. One of the limitations of this tool is that these three parameters only indicate the presence or absence of a condition or action and are not able to consider variables that might make a trait positive or negative. While a few of the parameters might be refined to better

measure appropriateness of the care received, the preponderance of evidence indicates staff education improved evidence based asthma management at the SHC. Findings from this study will be incorporated into the next staff education, and they will form the basis for the next cycle of CQI EMR review.

Table 3.

Frequencies of the 23 Parameters Based on NAEPP EPR 3 Recommendations

		Parameter	2010 (Baseline) Spring % (*n*=25)	2011 Spring % (*n*=50)	2011 Fall % (*n*=50)
1	1a	ACT Score	88	64	76
2	1b	Current medication	100	100	96
3	2a	Symptom patient experiences	92	94	98
4	2b	Frequency of rescue inhaler use	80	90	94
5	2c	Indicated allergy symptoms or triggers	72	78	86
6	2d	Indicated used of home Peak Flow Meter	0	14	48
7	2e	Prior PFT status	32	14	42
8	2f	Indicated PMH ER visit or hospitalization for asthma	32	40	60
9	3a	Physical exam for upper airway	88	74	84
10	3b	Physical exam for lung exam	100	98	98
11	3c	Measured Peak Flow reading and SaO2	92	68	72
12	3d	Administration of albuterol nebulizer treatment and documented response	28	22	6
13	4a	Diagnosed with asthma	100	100	98
14	4b	Documented level of asthma	24	38	50
15	5a	Indicated written asthma action plan given to patient	0	18	54
16	5b	Documented education about medications	92	50	74
17	5c	Appropriately used controller medication	64	34	58
18	5d	Discussed control of external triggers	60	28	78
19	5e	Indicated follow up interval	88	98	90
20	5f	Referred to specialty care	4	0	14
21	5g	Treated for comorbid conditions appropriate for asthma	80	42	74
22	5h	Recommended wean off unnecessary controller medications	0	0	20
23	5i	Recommendation to direct follow up based on rescue inhaler use	28	20	42

Table 4.

2008-2011 SHC Spirometry Performance Table

Time period	Frequency	Note
5/18/2008-5/17/2009	10	Before SHC QI period
5/18/2009-5/14/2010	29	Initial staff spirometry education effective
5/15/2010-5/15/2011	39	Ongoing staff education
5/16/2011-12/16/2011	1	Spirometry malfunctioning and unable to utilize

Dissemination and Utilization of Results

The findings of this capstone project will be shared with SHC staff during a staff training event to be scheduled following project completion. The results will be submitted for publication in a peer-reviewed journal. The study will be made available online and may be included in professional online journals.

While this project has demonstrated improved, evidence based asthma management in the SHC, it has also identified some areas for improvement in how the national guidelines can be implemented in a university setting. As a CQI project, the process of interventions and evaluation of effectiveness is a never-ending cycle. Dialogue with staff members will be ongoing and input from the staff will be included in plans to revise the parameters to more closely reflect the needs of the SHC population. In addition, although it was not part of this study to assess how many students were utilizing

peak flow meters and inhaler spacers, student comments indicate they seldom use these important asthma management tools outside of the clinic. Most students rely on SABA for symptom relief rather than using a PFM, which categorizes asthma symptom levels as green, yellow, or red based on empirical standards as a measure of the effectiveness of LABA. Reviewing a patient's asthma action plan for each visit is not practical in a university setting; a clinician review of medication may be more meaningful along with advice to go to the nearest emergency department or Quick Care after clinic hours if they experience asthma exacerbation. This study will be used as support for future grant application for the purchase of user-friendly spirometry equipment, which can be used for routine testing before rooming the patients rather than scheduling them to return for another appointment just for spirometry. In order to increase spirometry use, it is essential to offer it without charge, which will require applications for grants and a search for other funding sources. Additional QI studies such as a provider-focused analysis or an instrument-specific collection of data—for example, ACT scores or spirometry results—will add strength to the evaluation of the quality of asthma management in the SHC.

APPENDIX A

STAFF EDUCATION POWERPOINT OUTLINE

Asthma
Hedian Swanson, MSN, FNP-BC
University of Nevada Las Vegas
Student Health Center

Asthma
(NHLBI, 2011)
Chronic inflammatory airway disease
Reversible but recurrent exacerbation decreases lung function more rapidly
Affects QOL, productivity and causes financial burden
Under controlled: over estimation of control, under treated

Prevalence
Estimated 300 M all ages, ethnic background suffer worldwide (GINA, 2011)
24.6 M (8.2%) Americans are affected (Akinbami, Moorman, & Liu, 2011)
- 6 million are children

8.6% in ACHA spring 2010 survey (ACHA, 2010)
<1% of SHC 2009-2010 (out of 19,000 visit)

Causes
Genetic factors
Environmental Factors (allergens)
- Dust, animal fur, cockroaches, mold, pollens
- Irritants: cigarette smoke, air pollution, chemical, dust, sprays,
- Medication: ASA, NSAID, nonselective beta-blockers
- Sulfites in food/drinks
- Cold
- Physical activity: EIA

Assessment
Common symptoms
- Cough, wheezing, chest tightness, shortness of breath
- Symptom history
  - Frequency of day time symptoms, nocturnal awakening, associated illness
  - Triggers
  - ER visits, hospitalization, intubation Hx
  - Peak Flow Meter readings
  - Room air pulse oximetry
- Physical Exam
- PFT
- Bronchoprovacation

Diagnosis Category
Intrinsic/Extrinsic
Intermittent
Mild Persistent
Moderate Persistent
Severe Persistent
Exacerbation
Exercise Induced Asthma (EIA)

Treatment
Medication: Stepwise Approach
- Step Up, Step Down
- SABA: Rescue Medication
- LABA: Black Box warning.
- ICS
- ICS + LABA
- Leukotriene receptor antagonist
- Theophylline
- Treatment for comorbidity
- Immunotherapy
- Patient education

Prevention: Control triggers, prevent exacerbation

Peak Flow Meter
Hand-held device: Readily available
Maximum Speed of Expiration
Measures the airflow through the bronchi, degree of obstruction in the airway
Age, Sex, Ht
Green, Yellow & Red Zone
Subjective- Effort dependent
Cleaning
- Home: Wash in hot water and mild detergent once a week
- Clinic: Concern for cross contamination

Why Spirometry?
Vital signs for lung function
Normal lung function declines during 20s
Asthmatic lung function sub-normal

Assessment for treatment effectiveness
SHC performed 29 spirometry in 2009-2010, **39** in **2010-2011(out of 219 asthma dx'd visits)**

Spirometry
Asthma Action Plan
All students with asthma Dx should have one
Update every visit
SHC: Adapted from NIH Asthma Action Plan
Patient Education
Emergency Plan
Student Health Center & Asthma

Management
Thorough current Sx & past asthma Hx
Asthma Control Test for each visit
Pulse Ox, Peak Flow Meter, Current Rx
- Appropriate Diagnosis
- Appropriate Treatment: Step Up & Step Down
- Educate Patients
- Document
- Spirometry every 1-2 years for well controlled

Student Health Center & Asthma Management (Cont'd)
EMR
- SOAP Note: Subjective, discharge plan check list

Spirometry Pt handout
Asthma Action Plan

Order spirometry

3 best values
Pre & Post if new Dx
Coach, coach & Coach!

2010-2011 EMR review by Ms. Dunne

Improved: Indicated peak flow use, Prior PFT, level of asthma, suggested f/u
Needs Improvement: Post neb tx response, controller Rx, Tx comorbid condition, Rx education
Conclusion

Asthma is a chronic inflammatory airway dz
Affect all ages & ethnic background
Can be controlled but Under controlled
SHC staff can make the difference
Monitor lung function
Recommend follow up
Educate the patients

References

Akinbami, L. J., Moorman, J. E., & Liu, X. (2011). *Asthma prevalence, health care use, and mortality: United states, 2005-2009.* (National health statistics reports No. 32). Hyattsville, MD:

National Center for Health Statistics.
American College Health Association. (2010). *American college health association-national college health assessment II: Reference group executive summary.* No. Spring 2010.
Linthicum, MD: American College Health Association.

The Global Initiative for Asthma (GINA, 2011). Global burden of asthma. Retrieved from http://www.ginasthma.org/reports-global-burden-of-asthma.html
National Heart Lung and Blood Institute (NHLBI, 2011). Asthma, Retrieved from http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html

APPENDIX B

OUTLINE FOR SHC STAFF IN-SERVICE ON ASTHMA.

Asthma is "a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation." (NHLBI, 2007, p. 9)

Prevalence

- 300 million people in the world (WHO, 2006)
- 24.6 million Americans have asthma (Akinbami, Moorman, Liu, 2011)
- 8.8% college students reported asthma diagnosis or treatment within last 12 months (ACHA, 2010)
- Less than 1% of visits in UNLV SHC 2009-2010 EMR review with asthma diagnosis: Asthma is not one of the top 10 diagnosis in SHC, however, some EMR had ICD 9 codes as shortness of breath, cough, medication refill, allergic rhinitis while PMH indicated asthma (intrinsic or extrinsic).
- Our % is much lower than the national findings- Is that mean UNLV students are better controlled with asthma?

Guideline-based asthma care: Attempt to improve and standardize the quality of care

NAEPP Expert Panel Report 3 Highlights

Severity, control and responsiveness to treatment

Severity: Impairment and risk, important to initiate proper treatment
- Intermittent
- Mild Persistent
- Moderate Persistent
- Severe Persistent

Control: Level of control guides decisions to either maintain or adjust therapy (Step up if needed or step down if possible)

Monitor and reassess
- Starting therapy or stepping up to regain asthma control: every 2-6 weeks
- Controlled: every 1-6 months: review asthma control, medication technique, written asthma care action plan, adherence and concerns at every visit

Education and partnership with students

Consider students' culture and life style
Develop written asthma action plan and review with students
Integrate patient education in every visit (strength of SHC)
Patient education and reinforce: self monitoring via peak flow or symptoms, action plan, medication used correctly (inhaler technique and device use such as spacer)
Control environment

Medications

Select medication and delivery devices to meet students' needs and circumstances
Stepwise approach
- ICS are part of the preferred treatment for persistent asthma
- LABAs + ICS when stepping up therapy
- All student using ICS/ICS + LABAs should have SABA

Long Term Management

Monitor:

- Signs and symptoms of asthma

- Pulmonary function: spirometry (at least every 1-2 years to assess the maintenance of airway function), peak flow monitoring (moderate or severe persistent asthma, history of severe exacerbation) or symptom based monitoring at home and during office visit
- Quality of life
- History of asthma exacerbation
- Medication adherence and potential side effect
- Student-provider communication and student satisfaction

Review Student Health Center QI findings from 2009-2010 Academic year

See attachment

References for In-Service

National Heart, Lung, and Blood Institute. (2007). *National asthma education and prevention program expert panel report 3: Guidelines for the diagnosis and management of asthma*. Bethesda, MD: National Institute of Health. National Heart, Lung and Blood Institute.

American College Health Association. (2010). *American college health association-national college health assessment II: Reference group executive summary.* No. Spring 2010. Linthicum, MD: American College Health Association.

Akinbami, L. J., Moorman, J. E., & Liu, X. (2011). *Asthma prevalence, health care use, and mortality: United states, 2005-2009.* (National health statistics reports No. 32). Hyattsville, MD: National Center for Health Statistics.

World Health Organization (WHO). (2006). *Fact sheet no. 307.* Retrieved January 23, 2011, from http://www.who.int/respiratory/asthma/scope/en/index.html

APPENDIX C

CLINICIAN MEETING IN-SERVICE.

NAEPP EPR 3 Highlights

National Asthma Education and Prevention Program Expert Panel Report 3 (NAEPP EPR 3) 2007 highlights

Severity: Important to assess asthma symptom severity to initiate right therapy

Symptoms: Nighttime awakenings, SABA use for symptom control (not prevention of EIB), interference of normal activity, lung function

- Intermittent
- Mild, Moderate, Severe Persistent

Control: The goal for asthma therapy

- Consider step down if well controlled for at least 3 months
- *Well Controlled*: Risk for exacerbations requiring oral systemic corticosteroids 0-1/year

Symptoms ≤ 2 days/week, nighttime awakenings ≤ 2x/month, no interference with normal activity, SABA use ≤ 2x/week, FEV1 or peak flow >80% Predicted/personal best, ACT ≥20

Impairment and risk are the 2 key domains of severity and control
Use multiple measures for assessment
Impairment: Frequency and intensity of Sx and functional limitations the pt is experiencing currently or has recently experienced
Risk: Likelihood of exacerbation or progressive decline in lung function, or risk of AE from medication

Management of Asthma

The course of the disease may change over time
Stepwise approach: 6 steps
Medication: Based on the 6 steps
ICSs: Preferred long-term control therapy for all ages
LABA + ICS equally preferred option (age 5 or older)
Omalizumab (Xolair) ≥12 : step 5 or 6 care (severe asthma)- refer to asthma/allergy

Multifaceted Approach

Patient education: all points of care
Environmental Control: multifaceted approaches because single interventions are generally
ineffective
Immunotherapy
Potential benefit to asthma control from treating comorbid conditions

Modifications to treatment strategies for managing asthma exacerbations

These are for urgent or emergency care setting: Severe exacerbation <40% predicted FEV1 or PEF. Goal for discharge is a ≥70% predicted FEV1 or PEF. Encourage development of pre-hospital protocols; modification of medication

APPENDIX D

AGREE APPRAISAL INSTRUMENT NGC 5905

SCOPE AND PURPOSE (items 1 – 3)

1. The overall objective(s) of the guideline is (are) specifically described					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The objectives did not specify potential health impact of the guideline. It did focus on helping clinicians and patients (Pt) make appropriate decisions about asthma care. Although this section did not describe in detail any objectives related to preventing complications or lowering the risks, the recommendation section of the report included some risk factors and quality of life issues.					

2. The clinical question(s) covered by the guideline is(are) specifically described.					
Strongly Agree	4	3	(2)	1	Strongly Disagree
Comments: There is no specific clinical question in this CPG, but one needs to consider that this is one of the 4 components of the asthma care CPG using the Expert Panel Report 3 (EPR-3). This report is "Measure of asthma assessment and monitoring" based on EPR-2 and EPR-3. However, it included specifics for an asthma action plan, frequency of Peak Function Test (PFT), use of Peak Flow monitoring (PFM), frequency of follow ups, and questions which form a basis for when referral to asthma specialist may be appropriate.					

3. The patients to whom the guideline is meant to apply are specifically described.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The EPR-3 included generalized target population as infant, children, adolescents, and adults with asthma without specific categories. It does not specify gender differences or populations with certain occupational exposure or exercise induced asthma. For an example, sex matters in calculating PFM results and some patients experience asthma symptom (Sx) only during exercise. However in the EPR-3 full report, it subcategorizes special groups in treatment section.					

STAKEHOLDER INVOLVEMENT (items 4-7)

4. The guideline development group includes individuals from all the relevant professional groups.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The Expert Panel on the Diagnosis and Management of Asthma members consisted mostly of MDs, with					

only one DNS RN and one PharmD listed in this CPG summary. Asthma is managed by nurse practitioners in primary care on a daily basis and a more diverse representation is necessary.

5. The patients' views and preferences have been sought.					
Strongly Agree	4	3	2	(1)	Strongly Disagree
Comments: This report does not include any Pt input on what is desired management for their health management, but it is based on the clinicians' informed judgment and on research findings.					

6. The target users of the guideline are clearly defined.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The intended users were listed as APNs/nurses, allied health personnel, health plans, nurses, PAs and respiratory care practitioners. It did not include educational institutions.					

7. The guideline has been piloted among target users.					
Strongly Agree	4	3	(2)	1	Strongly Disagree
Comments: There was no indication of a pilot study among target users for further validation by the intended users. This report is an update from EPR- 2 which was published in 1997 (with partial update in 2002). In the past 10 years asthma related research has significantly expanded knowledge of this illness. This report reflected clinical judgment as manifested by simplifying the various categories of severity of asthma.					

RIGOUR OF DEVELOPMENT (items 8-14)

8. Systematic methods were used to search for evidence.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: Hand searches of published primary sources and search of electronic databases were used over 3 cycles in an 18-month period. It utilized inclusion and exclusion criteria and the literature review in broad spectrum initially, then later were refined by using asthma related research publications. It also reflected the EPR-2 1997 and Update 2002 as the framework.					

RIGOUR OF DEVELOPMENT (cont)

9. The criteria for selecting the evidence are clearly described.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: It specified inclusion factors such as literature review from published Meta-analyses and English language peer-reviewed medical journals in the MEDLINE database. They listed search terms and time frame, publication type limits, and additional terms used to produce results that more closely matched the framework of topics and subtopics. However it did not specify exclusion criteria, although the full report indicated that some titles and abstracts were excluded during the review process. One can suppose that what is not in inclusion criteria may be the other, but specifying the exclusion criteria would be helpful in further assessing why the particular area was not included in the study.					

10. The methods used for formulating the recommendations are clearly described.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: This report clearly described the method used to formulate the recommendations and how the final decisions were made. The expert consensus was used to formulate the recommendation and 8 steps were used to develop the report including several layers of external review. The report was posted on the National Heart, Lungs, and Blood Institute (NHLBI) web site for review and comments by the public and the National Asthma Education and Prevention Program (NAEPP) coordinating committee.					

11. The health benefits, side effects and risks have been considered in formulating the recommendations.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The report clearly identifies potential benefits from effective medical management of asthma for patients and their families: improved lung function, reduced use of medications, increased self-management and quality of life for patients and their families, and reduced use of health care services/interventions. No potential harms were stated. However, it did consider risk factors related to lack of asthma education or biases that may be created by the patient's cultural experiences. The report discussed alternatives to spirometry such as PFM use for socioeconomically underserved patients.					

12. There is an explicit link between the recommendations and the supporting evidence.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: The NAEPP provided ranking of evidence for recommendations based on the scientific literature and the current evidence review, but NAEPP did not assign evidence rankings to recommendations "pulled through" from EPR-2 (1997) for topics important to asthma diagnosis (Dx) and management; there was little new published literature. For					

an example: “The clinician, to establish Dx of asthma, should determine that episodic Sx of airflow obstruction are present, airflow obstruction is at least partially reversible and alternative diagnoses are excluded” (EPR -2 1997)

13. The guideline has been externally reviewed by experts prior to its publication.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: The summary stated that the draft of the EPR -3 was reviewed by a panel of expert consultants for their review and comments. The revised draft of EPR was circulated to the NAEPP Guidelines Implementation Panel for their comment. This draft was posted on the NHLBI Web site for public comment. According to the full report, the Expert Panel considered 721 comments from 140 reviewers, went through another editing process before the full EPR -3 was finalized and published in 2007.The full reference listing is available in the full report that I obtained through NHLBI.					

14. A procedure for updating the guideline is provided.					
Strongly Agree	4	3	(2)	1	Strongly Disagree
Comments: No update guidelines are mentioned in the summary. In updating from EPR-2 to EPR-3, the report describes 3 literature review cycles during an 18 month period, and the following method was used to formulate the recommendations: (1) a comprehensive search of the literature, (2) an in-depth review of relevant abstracts and articles, (3) utilization of evidence tables to assess the weight of current and past recommendations, (4) discussion and interpretation of findings, (5) ranking strength of evidence, (6) updating existing guideline with new findings from the evidence review, (7) external, NHLBI, and NAECP review processes, and (8) preparation for the final report after the review cycle. The summary leaves one to assume that a similar procedure will be followed to develop EPR-4.					

CLARITY AND PRESENTATION (items 15-18)

15. The recommendations are specific and unambiguous.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: In general the EPR provides specifics of initial assessment for classification, but it is not clear how often to categorize the pt by their Sx. The severity level can be interpreted differently among clinicians depending on what questions they ask and how the Pt feels that day. For an example, a Pt can be categorized as “moderate persistent” today, but could be place in a less severe category when the pt follows up with another provider. This can affect the asthma treatment plan. Another ambiguity is that the report uses clinician and physician alternatively in the recommendation section. Significantly, it states that the office based physician should have access to spirometry. In my practice, I am the only provider who is certified with NIOSH approved spirometry training. Does that mean that only a physician should have access to spirometry? It is not clear and sounds biased.					

16. The different options for management of the condition are clearly presented.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: Summarizing the detailed options listed in the full EPR-3 makes the recommendations in the summary seem vague and imprecise. The recommendation for PFM use is somewhat confusing. The summary seems to assume that all clinicians will ask appropriate questions to the Pt to correctly categorize asthma exacerbation.					

17. Key recommendations are easily identifiable.					
Strongly Agree	4	3	(2)	1	Strongly Disagree
Comments: The formatting of the summary report makes it very difficult to follow where the different sections begin and end. The headings and subtitles are blended together and are difficult to read. I ordered the full report (EPR-3) from NHLBI and it was very helpful and much easier to follow from one topic to another. The full EPR would be a 4.					

18. The guideline is supported with tools for application.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: The summary report listed implementation tools which include foreign language translations, patient resources, quick reference guides, physician (I think this term should be changed to "provider or clinician") guides and resources. The full report book has examples of each tool and is an excellent resource for primary care providers.					

APPLICABILITY (items 19-23)

19. The potential organizational barriers in applying the recommendations have been discussed.					
Strongly Agree	4	3	2	(1)	Strongly Disagree
Comments: The EPR summary does not list organizational barriers although under the qualifying statement, it says that the guidelines are intended to inform, not replace clinical judgment. Also, it recommends the clinician and the Pt develop individual Tx plans specific to the needs and circumstances of the Pt.					

20. The potential cost implications of applying the recommendations have been considered.					
Strongly Agree	4	3	2	(1)	Strongly Disagree
Comments: The EPR summary has no formal cost analysis nor was any published cost analysis reviewed. It is					

disappointing for me because the Expert Panel can recommend a systematic research based report for practice guidance, but ignores the impact of the financial burden on the patient. The most difficult challenge I face in every day practice is the cost of inhalers for short acting bronchodilators (SAB) or inhaled corticosteroids (ICS). This cost contributes to poor compliance issues since more than 50% of my patients don't have health insurance.

21. The guideline presents key review criteria for monitoring and/or audit purposes.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: The summary and full report includes clearly defined review criteria. It includes Sx, severity categories, PFM parameters, Spirometry results (FVC, FEV1, FEV1/FVC, and FEV6), f/u recommendations and referrals and co-management recommendations. The full report provides details on asthma assessment and monitoring criteria. However, it does not include review criteria for audit purposes.					

22. The guideline is editorially independent from the funding body.					
Strongly Agree	4	(3)	2	1	Strongly Disagree
Comments: Development of EPR-3 was entirely funded by the NHLBI and National Institutes of Health (NIH). The guideline committees were NAEPP coordinating committee and the Third Expert Panel on the Dx and management of asthma. The committees are under the big umbrella of the NIH					

23. Conflicts of interest of guideline development members have been recorded.					
Strongly Agree	(4)	3	2	1	Strongly Disagree
Comments: The financial disclosures and conflicts of interest were listed in the report summary. I gave (4) for presence of documentation, but I found it interesting to see how many physicians had financial disclosures or conflicts of interest. Although the members were volunteers and received only transportation related expenses, most of them (16/18 in summary listing) had some types of conflict of interest					

FURTHER COMMENTS

Total score 66 (mean score 2.9): This was a valuable experience to learn in detail about the process of guideline creation. Until I was exposed to this material, I assumed that the "guideline" was an absolute mandate for providing best care to the patient. Now I realize that an educated person should look into further detail on how the recommendation was created. Not all CPGs are equal. Although I complained about a lack of cost considerations in #20, it is after all, the clinician's informed judgment to tailor Pt care into a specific situation to bring out the best Pt outcome. In all cases, the clinician must respect the Pt's autonomy and final decision on treatment options

APPENDIX E

UNLV INSTITUTIONAL PERMISSION

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Office of Research Integrity – Human Subjects
University of Nevada Las Vegas
4505 Maryland Parkway Box 451047
Las Vegas, NV 89154-1047

Subject: Letter of Authorization to Conduct Research at UNLV Student Health Center

Dear Office of Research Integrity – Human Subjects:

This letter will serve as authorization for the University of Nevada, Las Vegas ("UNLV") researcher/research team, Hedian Swanson, MSN, APRN and Patricia T. Alpert, DrPH, FNP, PNP, CNE and Associate Professor to conduct the research project entitled "Improving Evidence Based Asthma Management in an Urban University Student Health Center" at UNLV Student Health Center, UNLV, 4505 S. Maryland Parkway, Las Vegas NV 89154-3020.

The Facility acknowledges that it has reviewed the protocol presented by the researcher, as well as the associated risks to the Facility. The Facility accepts the protocol and the associated risks to the Facility, and authorizes the research project to proceed. The research project may be implemented at the Facility upon approval from the UNLV Institutional Review Board.

If we have any concerns or require additional information, we will contact the researcher and/or the UNLV Office of Research Integrity – Human Subjects.

Sincerely,

Facility's Authorized Signatory

February 15, 2011
Date

Tina Saddler, Director, UNLV Student Health Center
Printed Name and Title of Authorized Signatory

Student Health Services
Student Wellness • Division of Student Affairs
Box 453020 • 4505 Maryland Parkway
Las Vegas NV 89154-3020
Main 702-895-3370 • Fax 702-895-4316

APPENDIX F

JHNEBP MODEL & TOOLS PERMISSION

To: "'Hedian.Swanson@unlv.edu'" <Hedian.Swanson@unlv.edu>
From: "Gould, Lois" <lgould@son.jhmi.edu>
Date: 02/15/2011 08:46AM
Subject: Copyright Permission

(See attached file: AppendixD__PET.pdf)

Hello Hedian,

You have our permission to use the Johns Hopkins Nursing Evidence-based Practice Model and Tools for your DNP capstone project. If you choose to use the Johns Hopkins Nursing Evidence-based Practice Model and Tools in any other way, please submit a request for that specific use. No modifications to the model or tools can be made without permission. All reference to source forms should include "© The Johns Hopkins Hospital/The Johns Hopkins University."

Good luck…

Lois Gould

Manager, Continuing Education

The Institute for Johns Hopkins Nursing

525 North Wolfe Street, Room 532

Baltimore, MD 21205

(P) 410.614.1978 / (F) 410.614.8972

www.ijhn.jhmi.edu

APPENDIX G

DEMING'S PDSA CYCLE USE PERMISSION

From: Pamela L Quick [mailto:quik@MIT.EDU]
Sent: Monday, February 13, 2012 8:49 AM
To: Hedian Swanson
Subject: Re: Hedian Swanson - Permission for PDSA Cycle copy

Dear Hedian Swanson,

Thank you for your message. I am happy to allow you to include the figure from THE NEW ECONOMICS in your paper for the University of Nevada. Please credit the figure to W. Edwards Deming, THE NEW ECONOMICS FOR INDUSTRY, GOVERNMENT, EDUCATION, 2nd edition, published by The MIT Press. Please let me know if you have any questions.

Very best,

Pamela Quick

Permissions Manager

From: Diana Cahill [mailto:ddc@deming.org]
Sent: Sunday, February 12, 2012 6:59 PM
To: Hedian Swanson
Cc: Pamela L Quick
Subject: Re: Permission to Use

Dear Hedian,

I am grateful to you for making the change in your material to PDSA and am glad that you have your own copy of *The New Economics.* I hope it is helpful to you.

You may use the PDSA cycle in your study but if you make an actual copy from the book, permission must come from the publisher, MIT Press. Please send your request to Pamela Quick at quik@mIT.EDU. I am certain that she will help you. Best wishes to you on your project.

Sincerely yours,
Diana Deming Cahill

APPENDIX H

UNLV IRB APPROVAL

Biomedical IRB – Exempt Review
Deemed Exempt

DATE: **June 6**, 2011

TO: **Dr. Patricia Alpert,** Nursing

FROM: Office of Research Integrity – Human Subjects

RE: Notification of review by /John Mercer/Dr. John Mercer, Chair
Protocol Title: Improving Evidence Based Asthma Management in an Urban University Student Health Center
Protocol # 1104-3810

-

This memorandum is notification that the project referenced above has been reviewed as indicated in Federal regulatory statutes 45CFR46 and deemed exempt under 45 CFR 46.101(b)4.

Any changes to the application may cause this project to require a different level of IRB review. Should any changes need to be made, please submit a **Modification Form**. When the above-referenced project has been completed, please submit a **Continuing Review/Progress Completion report** to notify ORI – HS of its closure.

If you have questions or require any assistance, please contact the Office of Research Integrity - Human Subjects at IRB@unlv.edu or call 895-2794.

REFERENCES

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