Evaluation of Emergency Department Throat Pain Protocol to Reduce Left Without Being Seen, Length of Stay, and Antibiotic Prescribing

Deanna R.C. Settelmeyer, DNP, RN, AGCNS-BC, CEN
Springfield, Oregon

Master of Science in Nursing, University of Virginia, 2015
Bachelor of Science in Nursing, University of Portland, 2002

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Beth D. Quatrara, DNP, RN, CMSRN, ACNS-BC _____
Signature of Chair

Pamela B. DeGuzman, PhD, MBA, RN _____
Signature of Member

Eric L. Sorensen, DNP, RN, ACNP-BC _____
Signature of Member

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Abstract

Background: Increasing numbers of people are seeking unscheduled, medical care in United States' emergency departments (ED) which contributes to crowding, delayed throughput and increased patient's length of stay. Implementation of advanced treatment protocols such as a throat pain protocol initiates early diagnostic testing, optimizes patient throughput strategies, and promotes adherence to clinic practice guidelines for an additional segment of patients.

Aim: To evaluate the effect of an advanced treatment protocol (ATP) for throat pain.

Methods: The electronic medical records for 117 patients presenting with throat pain to the ED of a community hospital were reviewed and separated into three groups: no testing, medical provider initiated testing, or nurse initiated testing. Main outcome variables were number of patients that leave without being seen (LWOBS), patient's length of stay, and antibiotic prescribing. Donabedian's conceptual model for examining health services and evaluating quality of care was utilized to implement this evidence-based project (Donabedian, 1997).

Results: No patients LWOBS from the nurse initiated ATP group or no testing group compared to 3% from the medical provider initiated group. By eliminating these LWOBS patients, there is a potential cost savings of $3,420 over a 12 month period. The overall length of stay (median) was four minutes shorter in the nurse initiated ATP group than the other two groups evaluated. Antibiotic prescriptions were given for 48% of patients in the nurse initiated group compared to 52% in the medical provider group, and 70% in the no testing group.

Conclusion: While this department has only partially implemented an ATP for throat pain, it highlights the benefits to reduce LWOBS, patient's length of stay, and antibiotic prescribing.

Keywords: protocols, standing orders, triage, emergency services, left without being seen, length of stay, antibiotic prescribing

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Evaluation of Emergency Department Throat Pain Protocol to Reduce Left Without Being Seen, Length of Stay, and Antibiotic Prescribing

Emergency department (ED) wait times are steadily increasing (Centers for Disease Control and Prevention, 2012). From 2003 through 2009, the mean wait time in United States' EDs increased 25% from 46.5 minutes to 58.1 minutes (CDC, 2012). This issue is complicated by a rise in the number of people seeking treatment for unscheduled, emergency services. From 1999 through 2009, the National Center for Health Statistics (NCHS) (as cited by the CDC, 2012) measured a 32% increase in number of visits to the ED. This represents an increase from 102.8 million visits in 1999 to 136.1 million visits in 2009 (CDC, 2012). The increased volume has led to delays in patient care, increased mortality and greater degree of patient dissatisfaction (Jang et al., 2013; Tekwani, Kerem, Mistry, Sayger, & Kulstad, 2013). Initiatives targeted at reducing the burden from ED crowding are needed to reduce the number of patients that leave without being seen, improve ED patient throughput, and promote adherence to clinical practice guidelines. The purposes of this paper are to (a) review current literature examining the use of triage protocols in the emergency department, and (b) present the findings from an evidence-based throat pain protocol based on Donabedian's conceptual model for assessing quality of care.

Background

Compared to other areas in the health system, the ED may be distinguished by a unique environment of competing priorities, fixed number of resources, and constrained manpower with a wide range of patient acuity presenting for unscheduled care. Currently, one of the biggest challenges in the ED is juggling patient volume and flow. The magnitude, implications and burden resulting from this problem has gained the attention of The Joint Commission (TJC) with an increased focus on patient flow in hospitals dictated by revised standards LD.04.03.11 and

PC.01.01.01 (The Joint Commission, 2012). TJC is now requiring hospitals to set specific goals to improve patient flow through the hospital visit and identifies individuals within hospital leadership as having responsibility to take action when patient flow goals are not met.

While there is a lack of consensus for the definition of ED crowding, experts agree crowding contributes to increased wait times, and higher rates of patient's leaving before seeing a medical provider (Beniuk, Boyle, & Clarkson, 2012; Chan, Killeen, Kelly, & Guss, 2005). The cause of ED crowding is multifactorial, but is generally thought to be secondary to input, throughput and output factors (Asplin et al., 2003; Beniuk et al., 2012). In a Delphi study reported by Bennie et al. (2012), expert consensus identified three input measures, three throughput measures, and two output measured to evaluate crowding. Input measures affect the flow of patients into the department and include the ability of ambulances to offload, patients who leave without being seen or treated, and time until triage (Bennie et al., 2012). Throughput measures affect the flow of patients and health care delivery in the department. Bennie and colleagues (2012), identified these throughput measures: ED occupancy rate, patient's total length of stay in the ED, and time to see a physician. Output measures affect the flow of patients leaving the department and can be evaluated by measuring the length of boarding time and number of patients boarding in the ED (Beniuk et al., 2012).

The percentage of patients who leave without being seen (LWOBS) in the ED is an outcome-oriented measure of impaired access to emergency care. An estimated 2% of all patients presenting to the ED leave without being seen by a medical provider (National Center for Health Statistics, 2009). When patients leave without evaluation by a medical provider they are either not getting the health care they need, or not receiving it in a timely manner, both of which can lead to a worse outcome. This is especially true for patients without insurance, under-

insured, or have impaired access to primary care. Furthermore, the LWOBS population exposes the ED to unmeasured liability, threaten the public image of the health system, and is a potential lost source of revenue (Arendt, Sadosty, Weaver, Brent, & Boie, 2003).

Increased patient volume has a direct impact on ED crowding and increased patient wait times (American College of Emergency Physicians [ACEP] Boarding Task Force, 2008). However, patient volume does not influence the acuity level assigned to patients during the triage process (Agency for Healthcare Research and Quality [AHRQ], 2013). While high acuity patients who require immediate and/or life sustaining medical intervention have not experienced increased wait times for receipt of care, this same trend has not been true for lower acuity patients (CDC, 2012; McHugh, Van Dyke, Yonek, & Moss, 2012; Robinson, 2013; White et al., 2013). The literature reports patients designated lower acuity are subjected to the longest length of stay with diagnostic imaging and laboratory tests associated with the longest increases (Derlet, McNamara, Kazzi, & Richards, 2014; Kocher, Meurer, Desmond, & Nallamothu, 2012; Robinson, 2013). A retrospective observational study conducted by Arendt et al. (2003) identified that 70.1% of patients who LWOBS would have remained in the ED if there had been the availability of immediate temporary treatments such over the counter pain medication.

Few studies have evaluated the financial impact of ED crowding and increased length of stay. One study conducted in two New York urban hospitals determined there is a potential cost savings of $9.8 million in the county hospital and $3.9 million in the university hospital if the facility eliminated ED boarding of adult admitted patients (Foley, Kifaieh, & Mallon, 2011). Despite the cost savings demonstrated in this study, Eds continue to have problems with throughput, and may need to dedicate resources to improve processes and redesign to best position themselves in a collaborative solution.

In the United States (U.S.), most Eds have adopted the Emergency Severity Index (ESI) for triage of patient acuity and resource utilization (McHugh et al., 2012). ESI is a triage system based on five levels that assigns the number of expected resources needed during the patient visit to make a disposition decision (AHRQ, 2013). Resources may include: labs, radiological procedures (including electrocardiogram), medications (but no medications administered by mouth), specialty consultations, simple procedures, or complex procedures (AHRQ, 2013). Non-resources include: history and physical, point-of-care testing, placement of a saline lock, prescription refills, phone call to primary care provider, simple wound care such as a recheck, or placement of splints or slings (AHRQ, 2013). In the traditional sense, triage involves a nursing assessment and assignment to that patient a level of priority for care based on their acuity, or assigned ESI number. Level one corresponds to the highest acuity, most resource-intensive patients, and level five corresponding to the lowest acuity, least resource-intensive patients (AHRQ, 2013). A patient who is not anticipated to need any medical resources is assigned an ESI level five (AHRQ, 2013). A patient with the anticipated need of one resource is assigned an ESI four, two resources ESI three, three or more resources ESI two, or immediate life-saving care such as cardiopulmonary resuscitation is an ESI one (AHRQ, 2013). The patient then awaits availability of treatment space. Upon assignment to a treatment location, the patient is then assessed by a second nurse and, finally, a medical provider before diagnostic testing is ordered.

Advanced treatment protocols (ATPs) allow nursing to initiate appropriate diagnostic tests for eligible patients based on an established set of procedures or algorithms after nursing's assessment of the patient's chief complaint and appropriateness for advanced treatment. It is estimated that more than two thirds of all patients presenting for medical care at an ED require

laboratory testing (Yoon, Steiner, & Reinhardt, 2003). ATPs have the capacity to reduce the time between patient arrival and initiation of diagnostic testing for specific chief complaints. Thus, moving patients through patient treatment areas more rapidly could lead to increased productivity despite constrained resources.

Each year, approximately 11 million people in the U.S. visit ambulatory care practices and Eds resulting in a diagnosis of pharyngitis (Linder, Chan, & Bates, 2006). According to the 2009 National Hospital Ambulatory Medical Care Survey (NHAMCS), patients with "symptoms referable to throat" was ranked as one of the ten leading reasons for ED visits (NHAMCS, 2009, table 10). These patients contribute to the number of patients seeking medical care in the ED and are likely triaged low acuity, such as an ESI four or five. ED patients with a chief complaint of throat pain present a unique challenge to patient throughput related to assignment of low acuity and the potential for additional time required for specimen processing.

While group A streptococcal (GAS) pharyngitis is responsible for only 5% to15% of sore throat visits in adults and 20% to 30% in children, it is the most common bacterial cause off acute pharyngitis (Aalbers et al., 2011; Linder et al., 2006; Shulman et al., 2012). Complications of strep throat can range from peritonsillar abscess to rheumatic fever or glomerular nephritis (Fine, Nizet, & Mandl, 2012). Due to the nonspecific clinical features of GAS pharyngitis, authorities have generally recommended laboratory confirmation of the presence of GAS before treatment with antibiotics (Aalbers et al., 2011; Centor, 2012; Fine et al., 2012; Linder et al., 2006; McIsaac, Kellner, Aufricht, Vanjaka, & Low, 2004; Shaikh, Leonard, & Martin, 2010; Shulman et al., 2012). The literature reports many providers prescribe empiric antibiotic treatment based on symptoms alone, often over-prescribing without confirmation of infection, and that accurate diagnosis on the basis of clinical grounds alone is usually impossible (Aalbers

et al., 2011; Linder et al., 2006; Shulman et al., 2012). When appropriate, the advantage of using antibiotics include a reduction in the duration of symptoms, missed work days, and spread of the disease (Aalbers et al., 2011; Fine et al., 2012). The estimated cost of pediatric GAS in the United States ranges from $224 million to $539 million per year, including indirect costs related to parental loss of work (Pfoh, Wessels, Goldmann, & Lee, 2008). Patients with throat pain represent one population that could benefit from a nurse-driven treatment algorithm.

Processes that promote throughput and are flexible enough to manage periods of high patient volume should be incorporated into ED standards of work. In the ED, treatment protocols and triage standing orders allow nursing staff to initiate diagnostic, therapeutic, and patient management regimens before provider examination for specific patient presentations. This method of medical care delivery is consistent with the recommendation made by the Institute of Medicine (2010) to utilize nurses to the full extent of their education and training (Institute of Medicine of the National Academies, 2010). The high volume of patients presenting with throat pain, potential for delays related to diagnostic testing, and over-prescribing of antibiotics make the adoption of a protocol for throat pain particularly well suited to the ED.

Review Purpose

P: patients utilizing emergency medical services

I: utilization of advanced treatment protocols (ATPs), nurse initiated protocols, or standing orders

C: standard practice (treatment orders indicated after assessment by a medical provider)

O: length of stay, appropriate antibiotic prescribing

The aim of this review is to examine if the use of an ATP for patients presenting with throat pain to the emergency department will reduce patient's length of stay and providers' antibiotic prescribing.

Theoretical Framework

Donabedian's (1997) conceptual model for examining health services and evaluating quality of care will be utilized to analyze the structures, processes and outcomes for this literature review and recommendation for quality improvement project. This framework was chosen for its versatile application to diverse healthcare settings and among various levels of health care delivery (Donabedian, 1997).

According to the model, information about quality of care can be drawn from three categories: structure, process, and outcomes (Donabedian, 1997). Structure includes all factors that affect the context and setting in which care is delivered (Donabedian, 1997). This includes material resources (e.g. physical facility, equipment, and supplies), human resources (e.g. number of qualified personnel), as well as organizational structure (e.g. staff training and payment methods). Processes make up the sum of all activities related to healthcare delivery from treatment and diagnosis to technical processes and interpersonal behaviors (Donabedian, 1997). Outcomes are the results of all healthcare related activities on the health status of patients and populations (Donabedian, 1997). At its most basic level, this framework can be used to modify structures and processes at the unit level via quality improvement projects, or in a much larger health system to improve overall quality and outcomes for populations. The model is often depicted as a series of three linked boxes representing the types of information collected (see Figure 1) (Donabedian, 2005).

Literature Review

The search strategy for this review of literature was designed to identify a wide array of potentially relevant research studies, review articles, and expert opinions. Articles were collected through a search of online databases encompassing the years 2005 to 2015 from Ovid

MEDLINE, Cumulative Index to Nursing and Allies Health Literature (CINHAL), the Cochrane Library, National Guideline Clearinghouse, grey literature via Google, as well as references from retrieved articles. Search terms consisted of multiple combinations of "protocols," "standing orders," "triage," "emergency services," and "length of stay." Initial inclusion and exclusion criteria were based on presence of key search terms, title of the article, then abstract review. Preference was given to studies conducted in the United States that focused on diagnostic tests and laboratory specimen processing. Articles evaluating the use of protocols for emergency team activation, radiological testing, stroke or sepsis alert, heart failure or testing for drugs of abuse were excluded. Additional articles were excluded with a focus on medication administration or outcomes that measured turnaround time but not length of stay. The final sample consisted of 10 articles that met all inclusion criteria.

Summary of Data

Among the 10 articles, four were research studies, five were various types of reviews and one was an expert consensus. All studies evaluated length of stay, no studies addressed antibiotic prescribing. Levels of evidence were assigned using *The Johns Hopkins Nursing Evidence-based Practice: Models and Guidelines* which resulted in two level I articles, two level II articles, two level III articles, three level IV articles, and one level V article (Dearholt, Dang, & Sigma Theta Tau International, 2008). The articles were divided into two groups based on the interventions evaluated. These groups are: bundled interventions, or laboratory specimen processing.

Definition of Key Terms. For this review, ATPs were included if they were initiated in triage or anytime during the course of patient visit to the ED. The terms treatment protocol, triage protocol and standing order are used interchangeably in the literature. In this review,

length of stay was described in the literature by two additional labels, patient flow and patient throughput. One study evaluated treatment time defined by time placed in treatment room to time of disposition (Retezar, Bessman, Ding, Zeger, & McCarthy, 2011).

Bundled interventions. Six articles evaluated the effect of bundled treatment interventions for a specific patient presentation, the sum effect from multiple protocols, or in combination with other process interventions (see Appendix A) (ACEP Boarding Task Force, 2008; Retezar et al., 2011; Robinson, 2013; Stauber, 2013; Welch, 2012; Wiler et al., 2010). The net effect from these interventions resulted in a reduction in length of stay between 2.45 and 74 minutes (Robinson, 2013). A study conducted by Retezar et al. (2011), determined that time savings was greatest for patients presenting for genitourinary complaints compared to protocols for chest pain, shortness of breath, or abdominal pain. Authors also determined that partially implemented protocols have a time savings benefit over no protocol to guide early implemented care. Robinson (2013) specifically reviewed protocol use in lower and middle acuity patients; he found the greatest time savings was recorded for patients with acuity level three based on the ESI triage system. In the literature, Wiler et al. (2010) discussed the limited published experiences using advanced triage protocols. While their review supports the notion of reduced length of time spent in the ED, they state that barriers to standardized implementation of protocols needs to be addressed and tested with rigorously designed, multi-institutional studies. An additional meta-synthesis by Welch (2012) strongly supports the use of treatment protocols to improve patient length of stay; however, the ACEP Boarding Task Force (2008) is less enthusiastic about their use. They subscribe to the use of point-of-care testing and advanced triage, but argue the cost to implement these procedures can exceed the amount of savings generated.

Only one study by Stauber (2013) reported an increase in the mean length of stay after protocol implementation using an abdominal pain protocol compared to medical provider initiated orders. In this retrospective study, the author reported a 107 minute increase in length of stay, but an 85 minute decrease in time spent in the examination room. The parameters of this protocol were not provided. Patients presenting with a chief complaint of abdominal pain may require a combination of more time consuming resources, such as laboratory specimens, pelvic examination, and/or radiological procedures like computed tomography (CT) scan with oral contrast that add to the length of stay. Additionally, the author reported patients in the protocol group remained in the waiting room while results processed and may or may not have been available by the time the patient was placed in a treatment room. It is unknown if other protocols were in place during the study or if it was clinical practice to keep patients in the waiting area until results posted. Each of these details could give the appearance of an increased length of stay for patients when using protocols.

Laboratory specimen processing. Point of care testing (POCT) is defined as testing that is performed outside of the central laboratory and may include simple tests such as urine human chorionic gonadotropin (HCG) and blood glucose, or more complex testing such as chemistry profiles and cardiac markers (Oredsson et al., 2011). Five articles evaluated the effect of laboratory specimen collection protocols and point of care testing (see Appendix B) (ACEP Boarding Task Force, 2008; Hsiao, Santucci, Dziura, & Baker, 2007; Jang et al., 2013; Oredsson et al., 2011; Singer, Ardise, Gulla, & Cangro, 2005). The net effect from these protocols resulted in a decreased length of stay between 21 and 114 minutes (Oredsson et al., 2011; Singer et al., 2005). The greatest time savings was reported for bedside troponin I testing (Singer et al., 2005). Jang et al. (2013), were able to decrease length of stay by 12 minutes through the use of a

comprehensive metabolic panel test. The ACEP Boarding Task Force (2008) also support the use of POCT to decrease length of stay but argue the cost to implement this process can exceed the amount of savings generated.

Literature Summary

Triage standing orders work by initiating the diagnostic evaluation earlier and expediting the decision making of the medical provider. By having the result of the triage standing orders at the same time or shortly after completing the history and physical examination of the patient, the provider can quickly determine whether further testing is necessary or a disposition can be made. ED and hospital leadership increasingly focus on ED length of stay as a measure of efficiency and throughput. Although length of stay in the ED can be affected by a variety of factors, it can be used to evaluate patient flow in a health system and is a quantitative measure of patient throughput. Two groups of interventions were evaluated to determine their impact on length of stay, and appropriate antibiotic prescribing: bundled interventions and laboratory specimen processing.

When protocols are bundled, the true effect from each intervention is difficult to determine. Despite the medium to low quality studies and limited data analysis for specific protocols, the data presented here suggests there may be benefit to implementation of protocols in the ED. Oredsson and colleagues (2011) point out that type of POCT testing can have an impact on length of stay, however, a significant portion of patients who receive POCT also require central laboratory testing. Each of these factors can negatively influence length of stay.

Research evaluating length of stay demonstrate a time savings through the use of protocols for laboratory specimen collection and point-of-care testing. This data is based on medium quality evidence. The ACEP Boarding Task Force (2008) is cautious to support point of

care testing systems due to procedural expenses incurred compared to benefits gained. A proper point of care system requires stringent quality control and training of ED personnel (Gregory, Tse, Wu, & Lewandrowski, 2012). While a satellite laboratory in the ED seems like an alternative solution, it would also require specialized personnel and equipment which would likely have an even greater associated expense.

Gaps in the Literature

No published studies evaluating ATPs in relation to antibiotic prescribing practices or throat pain protocol in the ED were identified in this literature review. Studies evaluating throat pain have historically focused on methods to diagnose bacterial versus viral etiology, or symptomatic and therapeutic management (Aalbers et al., 2011; Dooling, Shapiro, Van Beneden, Hersh, & Hicks, 2014; Ebell, 2014; Fernandes et al., 2014; Haighton & Wilson, 2015; Lean, Arnup, Danchin, & Steer, 2014; Linder et al., 2006; Matthys & De Meyere, 2014; Michel-Lepage, Ventelou, Verger, & Pulcini, 2014; Shulman et al., 2012; Sun, Guo, & Sun, 2014). However, a search of grey literature via the search engine Google, revealed the practice to obtain rapid step testing (RST) in emergency departments is a clinical norm across the country with varied assessment parameters to direct specimen collection (Rooney, 2010; University of North Carolina School of Medicine, 2013).

Experts agree, bacteria positive RSTs are sufficient verification of GAS to guide medical management (Centor, 2012; Linder et al., 2006; McIsaac et al., 2004; Shulman et al., 2012). Conversely, experts recommend back up testing with throat culture for adolescent and pediatric patients who demonstrate a high level of clinical suspicion for GAS related to the prevalence of infection in these age groups and sensitivity of the test (Linder et al., 2006; Shulman et al., 2012). In the ED, treatment for throat pain is often based on the RST because GAS testing via

throat culture requires 24 to 48 hours for results and it is difficult to follow up with a transient patient population (Wald, 2015). While the risk for complications from GAS is low for industrialized nations, the use of empiric antibiotic treatment is endorsed for patients who test positive with GAS by the American Academy of Family Practice (AAFP), American Academy of Pediatricians (AAP), American College of Physicians (ACP), Centers for Disease Control and Prevention (CDC), National Guideline Clearinghouse, and Infectious Diseases Society of America (IDSA) (Choby, 2009; Shulman et al., 2012).

Rationale for Project

Patients presenting to the ED with a chief complaint of throat pain present a unique challenge to patient throughput related to a triage assignment of low acuity that can lead to prolonged wait times. RST initiated early in the patient visit has the potential to reduce the number of patients that LWOBS, and length of time between patient arrival, laboratory confirmed diagnosis and discharge. RST can also guide appropriate treatment therapies. Implementation of a nursing treatment protocol that authorizes the collection and laboratory processing of RSTs has the potential to optimize the health care provider's time and streamline patient care.

Project Question

Does an ATP for patients presenting with throat pain to the emergency department reduce the number of patients that leave without being seen, patient's length of stay, and antibiotic prescribing?

Methods

Introduction of Project

Increasing numbers of people are seeking unscheduled, medical care in U.S. emergency departments. This contributes to ED crowding, delayed throughput and increased patient's length of stay. While ED crowding has had minimal impact on wait times for high acuity, resource-intensive patients, the same has not been true for lower acuity, less resource-intensive patients (CDC, 2012; McHugh et al., 2012; Robinson, 2013; White et al., 2013). Compounding the issue, more than two thirds of all patients presenting for medical care at an ED require medical laboratory testing (Yoon et al., 2003). Furthermore, as a result of the nonspecific clinical features of GAS pharyngitis, authorities have generally recommended laboratory confirmation of the presence of GAS before treatment with antibiotics (Aalbers et al., 2011; Centor, 2012; Fine et al., 2012; Linder et al., 2006; McIsaac et al., 2004; Shaikh et al., 2010; Shulman et al., 2012).

Implementation of ATPs has the potential to initiate early diagnostic testing with results available for provider review and clinical decision making. Moving patients through patient treatment areas more rapidly could lead to increased productivity despite constrained resources. This strategy is supported by the IOM who released a statement recommending the utilization of nurses to the full extent of their education and training (IOM, 2010). Patients with "symptoms referable to throat" were measured as one of the top ten reasons for ED visits by the 2009 National Hospital Ambulatory Medical Care Survey. Expansion of ATPs to include early RST for patients presenting with symptom of throat pain optimizes strategies for an additional segment of patients presenting for medical care in U.S. emergency departments.

At the community hospital where the project was implemented the average LWOBS trend is 1.7% compared to 2% for all hospitals nationally (National Center for Health Statistics, 2009). The LWOBS benchmark at this hospital is less than 1%. This ED has two treatment

areas. The main ED is open 24 hours a day and provides treatment to all acuity levels; the ancillary treatment area is designated for minor emergency care (MEC) and operates during historically high volume of patient census. While the median length of stay for patients treated and released from the main ED is 184 minutes and 80 minutes in the MEC area, the hospital benchmark for the "treat and release" of lower acuity patients in the MEC is a median of 75 minutes. Utilization of a throat pain protocol is one strategy that may decrease the number of patients waiting for medical care and make results available to guide treatment therapies earlier in the patient visit.

The purpose of the project was to evaluate the use of an evidence-based protocol for patients presenting to the ED with throat pain to determine the effect on the number of patients that leave without being seen, patient's length of stay, and appropriate antibiotic prescribing. Donabedian's conceptual model for examining health services and evaluating quality of care was utilized to analyze the structures, processes and outcomes for this evidence-based project (Donabedian, 1997).

Definition of Terms

Advanced treatment protocols. ATPs, guidelines used in the ED authorizing nurses to initiate diagnostic studies or therapeutic interventions for patients with specific complaints in collaboration with ED Attendings based on pre-established criteria. ATPs are often implemented when there are no treatment beds available, the patient is in stable condition, and the patient condition matches one of the established protocols. At this institution, ATPs can be initiated at any time before the medical provider has assumed primary responsibility of the patient. Thus, it is possible to initiate ATPs after the patient has been placed in a treatment bed.

There are no universal ATPs. ATPs are based on institutionally agreed upon treatment algorithms at the local level. The ATP for throat pain was developed and approved in collaboration with ED leadership and medical providers (see Appendix C). For additional definition of terms, see Table 1.

Project Design / Purpose

An evidence-based project was conducted to examine the effect of a throat pain protocol on left without being seen, patient length of stay, and appropriate antibiotic prescribing in the ED.

Setting

The intervention took place in a not-for-profit, community hospital with 176 licensed inpatient beds located in Central Virginia servicing a small urban city and surrounding rural counties. The ED has 29 staffed treatment beds that provide non-trauma, emergency and medical services for approximately 50,000 ED visits annually. Upon patient arrival, patients are triaged, assigned a triage category, and directed to either the main ED or MEC based on the triage assessment and assigned ESI level. The MEC area comprises six of the available treatment beds and is staffed by one nurse practitioner or physician assistant between 11:00 to 21:00 daily.

Description of Sample

A convenience sample was drawn from all ED patients, three years of age and older, who presented for medical care between the months of September 1st through November 30th, 2015. Patients were identified through a medical records search. This 90 day time period was chosen to capture the increased incidence of GAS pharyngitis during the fall (Wald, 2015). Chief complaints of throat pain and sore throat were included if the diagnosis was listed as one of the

following: acute pharyngitis, acute viral pharyngitis, viral pharyngitis, acute streptococcal pharyngitis, acute bacterial tonsillitis, acute tonsillitis, strep throat, exposure to strep throat, exudative pharyngitis, or scarlet fever. Patients who had documentation of throat pain as the chief complaint for potential causes other than viral or bacterial etiology were excluded (e.g. obstruction, recent surgery, laceration), as were children under three years. Centor and McIsaac criteria are not validated for use in children under the age of three, and complications from GAS such as acute rheumatic fever are rare in this age group (Shulman et al., 2012).

Procedures

All nurses who provide bedside care or assignment to the triage area were offered training to the use of the ATP for throat pain during July and August 2015. Staff were notified of the forthcoming practice change by department leadership via change of shift report and email. Approximately 81% of nurses working in the ED received training to throat pain assessment, specimen collection, documentation, and throat pain protocol. Current processes permit only nurses to collect throat specimens for laboratory analysis at this facility; however, an additional 50% of ED technicians were provided the same instruction.

The training occurred in small groups and/or one-on-one with visual aids and reference handout designed to train staff to correctly assess Centor and McIsaac criteria and collect specimens (see Appendix D). Training also included documentation of the throat pain score in the electronic medical record. The handout was emailed to all ED staff who provide bedside care with a copy of the training readily available for clinical reference.

The investigator identified medical records for inclusion using the reports generator feature in the electronic medical record. Reports were generated using the documented chief complaint and diagnosis to identify eligible medical records.

Measures

During the training period conducted during July and August 2015, the number of participating medical personnel and duty position were collected. Following protocol implementation, demographic measures were collected from medical records (see Table 3 for details). Other data points included time of patient arrival, specimen collection initiated by medical provider or nursing, number of patients that leave without being seen, length of patient's stay in minutes, lab result (positive or negative), antibiotic prescription (yes or no), and assigned acuity level during triage. Time of patient arrival was grouped by two categories: MEC hours of operation including one hour before opening (10:00 to 21:00), and non-operating hours of the MEC (21:01 to 9:59). The data collection sheet is presented in Appendix E.

Centor and McIsaac scoring criteria were used to assess and grade throat pain. The Centor score is a validated measure that aids clinicians to distinguish GAS from viral pharyngitis (Aalbers et al., 2011; Fine et al., 2012). The 4-point Centor score, presented in Table 2, calculates the likelihood of GAS infection and guides management by assigning one point for each of the following: (a) fever, (b) absence of cough, (c) presence of tonsillar exudates, and (d) swollen, tender anterior cervical nodes (Centor, Witherspoon, Brody, & Link, 1981).

McIsaac criteria is a validated measure that was added to Centor criteria to adjust the score based on patient age (Aalbers et al., 2011; Fine et al., 2012; McIsaac, White, Tannenbaum, & Low, 1998). One additional point is assigned for patient age 3 to 14 years, no points for age 15 to 44 years, and subtract one point for patient age 45 years and older (see Table 2) (McIsaac et al., 1998; McIsaac et al., 2004). Permission to use Centor and McIsaac assessment scoring criteria was granted by the authors.

Numerous professional organizations endorse the use of the Centor clinical scoring scale to assess the risk of GAS and guide management including: the Centers for Disease Control and Prevention (CDC), American College of Physicians (ACP), American Academy of Family Practice (AAFP), and American Society of Internal Medicine (ASIM) (as reported by Fine et al., 2012; Linder et al., 2006). According to the scoring system, a score of 0 to 1 point dictates do not test, do not treat; 2 points dictate treat if rapid strep test result positive. A score of 3 points has two options, treat if RST result is positive for GAS, or treat empirically, and a score of 4 points directs empiric treatment. For this project, a score of 2 points was used for the decision point to collect RST specimens.

Data Analysis

Microsoft Excel 2013 v.14.0 data package was used to analyze the data. Medical records were separated into two groups: *testing* and *no testing*. The testing group was subcategorized as testing initiated by nursing using the ATP or medical provider. ATP use is defined by the ordering and collection of RST and/or throat culture specimens by nursing staff. This is a quality improvement project that did not intent to perform statistical analysis. Instead, descriptive statistics were used to describe demographic data and compare trends between the three groups.

Patients that LWOBS were excluded from variables with missing data points. The number of LWOBS were compared from the testing versus no testing, and nurse initiated versus medical provider initiated groups. A cost analysis was calculated using the number of LWOBS during the three month data collection period multiplied by four to determine the hospital's potential cost savings over a year. From the groups of data, a comparison of the mean and median time differences in minutes was made for length of stay. The investigator compared length of stay during operational hours of the MEC to hours when the MEC was closed.

Examination of antibiotic prescribing practices included a calculation of a percentage of patients who had testing compared to patients who did not have testing. Additional calculation included the overall percentage of patients with bacteria positive RST and/or throat culture. Tests of statistical significance were not conducted, as data obtained from this project are not meant to be generalizable to other organizations.

Human Subjects Protection

Institutional Review Board (IRB) approval was obtained from both the hospital and university. Project procedures were reserved until IRB approval was obtained. The hospital's Nursing Shared Governance Practice Council approved the project proposal. To protect patient confidentiality, all personally identifiable information was removed before aggregation of data in accordance with the Health Insurance Portability and Accountability Act (HIPPA) of 1996, Privacy Rule in 2002, and Security Rule in 2003 (U.S. Department of Health and Human Services, 2015). Investigators leading the project had current Collaborative Institutional Training Initiative for Human Subjects Research and National Institute of Health Protecting Human Research Participants training (CITI Program: Collaborative Institutional Training Initiative at the University of Miami, 2014; National Institute of Health & Office of Extramural Research, 2011). During the project, a master list of medical records was maintained in the ED and locked in an office drawer. The investigator had no authority over nursing staff or conflict of interest.

Results

Donabedian's conceptual model for examining health services and evaluating quality of care was utilized to analyze the structures, processes, and outcomes of this evidence-based

project. In addition, the results after implementation of the throat pain protocol are presented on the number of patients that LWOBS, patient's length of stay, and antibiotic prescribing.

Donabedian's: Structure, Process, Outcomes

Application of the Donabedian Model: Structure, process, and outcomes to the ED environment revealed that structures are allocated to match patient demand and acuity level. While the footprint of the ED is fixed with a set number of beds, this facility operates under the contingency to expand treatment areas to nontraditional locations under periods of high patient volume such as the hallway or chairs. The quantity of equipment e.g. cardiac monitors and bed space that promotes patient privacy and confidentiality are also finite. Properly trained health care workers and support staff are also limited in supply. Flexing to meet increased patient demand for these resources is limited and may provide only short term gain.

This ED has adopted many processes that have the potential to facilitate patient throughput such as bedside registration, direct bedding, MEC for lower acuity patients, some advanced treatment protocols initiated by nursing, pneumatic tube system for specimen delivery, improved communication and staff locator systems, and benchmarking to improve patient throughput and turn-around times. Processes are limited by the autonomy and scope-of-practice permitted to nursing by physicians, hospital policy and regulatory bodies. ED technician's scope-of-practice is also limited. Health care is unique in that processes must be carried out safely, and within the scope-of-practice of each certifying agency.

New processes that are considered for implementation into clinical practice are scrutinized using a risk verses benefit ratio and cost analysis. While some point-of-care testing (POCT) has been implemented in this ED, RST is not one of them. A point-of-care system for

RST requires stringent quality control and training of ED personnel. Currently, the opinion for RST POCT in the ED is that the time savings will not outweigh the expenses incurred.

Development and institution of processes that are flexible enough to accommodate fluctuating patient volume, prioritization of patient care, staffing requirements, and budgetary constraints are complex. Quality of care is also a concern when clinical processes are stressed to meet operational tempo.

The outcomes of these initiatives can be measured by numerous metrics. For this project, the metrics evaluated were the number of patients that leave without being seen and patient length of stay. Additionally, the number of antibiotic prescriptions given was evaluated to measure adherence to clinical practice guidelines.

Demographics

A total of 117 patients who presented to the ED during the study period met inclusion criteria. The majority of participants who met inclusion criteria were age 15 to 44, female, Caucasian or African American, assigned a triage level four, and presented for medical care during operational hours of the MEC. Twenty-seven patients (23%) had no testing ordered, 67 (57%) had testing ordered by a medical provider, and 23 (20%) had testing initiated by nursing via the ATP.

There were some minor differences between the three groups. The no testing group had more patients triaged ESI level 3 (33%) compared to the other groups, while the medical provider initiated testing group contained the only patients triaged ESI level 2 (3%), and the nurse initiated group had more female patients (70%) that presented for care during operational hours of the MEC (78%). Additional demographic data are provided in Table 3.

Left Without Being Seen

Two patients LWOBS after spending an average of 2 hours and 38 minutes in the ED. Both patients received RST ordered by a medical provider while waiting for assessment and treatment by a medical provider, and both patients presented for medical care when the MEC was closed. Laboratory testing was canceled before results posted. There were no LWOBS in the no testing or nurse initiated protocol groups (see Table 4). Further data analysis removed missing LWOBS patient data from pooled results.

Based on data received from the hospital's financial reimbursement department, a patient with ESI level three has a $547 baseline treatment charge for direct and indirect costs associated with the patient visit. A patient with ESI level four has a $306 baseline charge. Using this data, patients who LWOBS during the study period resulted in $855 ($547 x 1 + $306 x 1 = $855) lost charges. Assuming a similar pattern of LWOBS over a period of 12 months for patients with throat pain and full payment for the dollar amount charge, there is a potential cost savings of $3,420 ($547 x 4 + $306 x 4 = $3420).

Length of Stay

Overall, patients with throat pain spent an average of 115 minutes in the ED from arrival to documented discharge (see Table 5). Nursing application of the ATP resulted in the shortest median length of stay overall, 92 minutes compared to 103 minutes for medical providers, and 96 minutes in the no testing group. Nursing application of the ATP also demonstrated the shortest mean length of stay during MEC hours of operation. Patients that had treatment initiated by the throat pain protocol demonstrated the longest length of stay when the MEC area was closed. Medical provider initiated testing resulted in the smallest range for length of stay, and no testing resulted in the largest range. The minimum length of time (shortest) spent in the ED, with the greatest efficiency for treating and releasing patients under various department

conditions was seen in the no testing group, medical provider initiated testing, and nurse initiated testing respectively.

Antibiotic Prescribing

Sixty-five patients (56%) were treated for GBS induced throat pain. Of these patients, 26 (23%) had laboratory confirmed GAS infection. The remaining 39 (34%) were prescribed antibiotics with negative or no testing (see Table 6). Patients in the ATP group received fewer prescriptions for antibiotics, 48% compared to 52% in the medical provider group, and 70% in the no testing group.

Discussion

When an ATP for throat pain was implemented by nursing in the ED of a 176-bed community hospital, patients' mean and median length of stay were shorter than those patients treated by medical provider initiated RST testing and those who did not receive testing. The no testing group demonstrated the shortest length of stay (29 minutes) and the longest length of stay (361 minutes). While patients treated by the nurse initiated group had greater variability in the total length of stay than for those treated by the medical provider initiated testing group, this was likely complicated by available treatment space once laboratory testing had resulted (e.g. when the MEC was closed). The only group with patients that LWOBS were in the medical provider initiated group. Additionally, adherence to clinical guidelines for antibiotic prescribing was greatest for those who had treatment initiated by nursing. The use of an ATP for throat pain to reduce patient's length of stay is clinically significant, but its intended function may be hindered by factors beyond the scope of this project.

It is possible that the best data demonstrating the results of a nurse driven protocol were obtained when the MEC area was closed. While the overall length of stay was shortest for the

nurse initiated ATP group, data limited by when the MEC area was closed resulted in the longest median length of stay for patients in the ATP group, 172 minutes compared to 122 minutes for the medical provider initiated group, and 119 minutes for no testing. This increased length of stay may reflect the lower ESI score assigned to patients presenting with throat pain when other more critically ill patients were occupying available treatment space. It is also possible that the increased length of stay represents a nurse staffing issue, or acceptability of adopting this additional duty by nursing staff at night as evidence by a meager 22% total implementation of the throat pain protocol. When the MEC was closed, no testing was the most common diagnostic regimen for throat pain.

It is clinically significant that no patients from the ATP group and no testing groups had no LWOBS compared to two patients from the medical provider group. This finding is consistent with research conducted by Arendt et al. (2003) who identified 70.1% of patients that LWOBS would have remained in the ED if there had been the availability of immediate temporary treatments such as over the counter pain medication. It is unknown how long these patients waited for medical care after the triage process to collection of throat specimens. It is possible that medical providers were ordering throat specimen collection prior to assessment of the patient, when bed space had reach its maximum capacity, an ideal time for nurses to initiate ATPs.

While clinical judgement may guide medical provider practice, the number of antibiotic prescriptions written as a result of parent/patient pressure is unknown. One study conducted by Linder and colleagues reported that only 53% of physicians tested for GAS, but 51% of patient visits for throat pain resulted in a prescription for antibiotics (Linder, Bates, Lee, & Finkelstein, 2005). This high rate of antibiotic over prescribing is consistent with all age groups, including

children (ages 18 and under) who are reported to have the highest prevalence (37%) of GAS (Shaikh et al., 2010). In comparison, a similar age group (ages 3 to 18) from this study had confirmed GAS positive culture in 16 cases (31%) with antibiotic prescriptions given for 26 cases (50%). Similar findings were noted in a separate study that reported only 50% of physicians adhere to clinical guidelines for the management of acute pharyngitis (Urkin et al., 2013). During this study, antibiotics were prescribed based on symptoms alone without laboratory confirmation of the presence of GAS, a practice that is generally not recommended based on the nonspecific clinical features of GAS pharyngitis (Aalbers et al., 2011; Centor, 2012; Fine et al., 2012; Linder et al., 2006; McIsaac et al., 2004; Shulman et al., 2012).

Early collection of throat specimens by nursing demonstrated fewer antibiotic prescriptions than for any other group. This finding is consistent with a study that accessed the safety and appropriateness of antibiotic use for a nurse-only triage system compared to a physician-directed clinical evaluation (Undeland, Kowalski, Berth, & Gundrum, 2010). In the study, physicians adhered to the antibiotic–prescribing guideline in 92.7% of first visits, whereas nurses using the algorithm adhered to the guidelines in 99.7% of first visits (Undeland et al., 2010).

Barriers to implementation

Implementing ATPs is a significant undertaking by emergency nurses. There is the potential added responsibility for emergency nurses to calculate and document the throat pain score, track laboratory results in the waiting room, as well as follow up on abnormal test results for patients who LWOBS. Additional considerations for implementing ATPs are the availability of physical space for specimen collection, equipment, dedicated staff trained to properly collect diagnostic tests, and transportation to the laboratory for specimen analysis. At this facility an ED

technician is often assigned to the triage area for delegation of tasks from the triage nurse to initiate ATPs. However, collection of throat specimens is currently limited to nursing staff only, which adds to the demands on nursing and represents a potential barrier to throat pain protocol implementation.

Although the use of ATPs is a common practice in this ED, informal discussions with nursing staff revealed the cultural practice to delay collection of laboratory specimens from patients triaged to the MEC. The reason stated for this clinical practice was the quick turnaround time for patients triage to placement in the MEC treatment area. It was also hypothesized that nurses delayed initiating the throat pain protocol due to the low acuity of patients with throat pain when other tasks and patient care requirements were deemed a higher priority. It is also possible that patients who were assigned a higher acuity level, but later had throat specimens collected, presented with other symptoms that were prioritized over throat pain. Enhanced nurse/patient staffing ratios that account for fluctuations in patient acuity and volume, and scope-of-practice that promotes the utilization of trained individuals to the highest level of their education and training may assist this ED to achieve its 75 minute “treat and release” benchmark for patient length of stay.

Medical Provider Preferences

Testing and management for strep throat is controversial among medical providers and the individual provider preference to test or not test was not assessed prior to project implementation. However, the scoring criteria for throat pain assessment and standardization for diagnostic testing by nursing was approved by the physician group prior to project implementation. Informal discussions with physicians revealed a variety of approaches to the diagnosis and management of throat pain. Some providers test all patients for GAS, while others

perform no testing. Some providers treat only patients with GAS positive test results, while others base management on clinical suspicion alone. While not ordering RST and throat culture may be seen as financial judiciousness, the hospital financial reimbursement department reports charging only $38 for RST and $51.50 for throat culture. Charges that are comparable to other institutions.

Strengths and Weaknesses to the Project

The value of this project is that it provides statistical data demonstrating the effect a throat pain protocol had on patient throughput in this ED and analysis of antibiotic prescribing practices for throat pain. There are several strengths to the project design. Nursing staff assigned to triage at this facility have a minimum of one year ED experience which may assist nursing to anticipate and implement appropriate ATPs early in the treatment regimen. Additionally, the use of protocols is an accepted part of clinical practice that staff report as beneficial to patient throughput.

This study is limited by the accuracy and completeness of documentation and coding in the electronic medical record. It is possible that some charts coded with a diagnosis of pharyngitis and had negative RST and/or throat culture were prescribed antibiotics for other medical conditions associated with throat pain (e.g. upper respiratory infection, or sinusitis). Adherence to all aspects of the ATP, primarily documentation of the throat pain score, is also a limitation. In addition, the discussion between medical provider and patient, on when and whether to use antibiotics or swab for a throat specimen, is not reflected.

Nursing Practice Implications

In the ED, prioritization of patient care is a constantly evolving phenomenon that cannot be well predicted. With increasing wait times across the country, it is important to investigate all

time-saving strategies that have the potential to improve ED throughput. The potential advantages of early orders center on decreasing time patients spend occupying an ED bed and decreasing the time a patient waits to consult a medical provider. ATPs have a potential to increase patient satisfaction, retain revenue lost from patients who might otherwise LWOBS, and improve adherence to clinical practice guidelines. Additionally, nurses should be permitted to practice to the full potential of their education and training. However, implementing ATPs is a significant undertaking by emergency nurses. This strain may be best demonstrated by the lack of diagnostic testing when the MEC was closed.

Secondary to perceived barriers, adoption of evidence-based practices (EBP) have historically been slow to implementation (Brown, Wickline, Ecoff, & Glaser, 2009; Ramos-Morcillo, Fernandez-Salazar, Ruzafa-Martinez, & Del-Pino-Casado, 2015). Brown and colleagues (2009) reported two of the largest barriers to implementation for nursing staff to be time and autonomy. According to their study, nurses identified patient acuity, short staffing, and workload as perceived time barriers (Brown et al., 2009). Barriers to autonomy were identified as medical provider acceptance or knowledge of new research, variance to clinical practice between medical providers, and a culture of "the way we have always done it attitude" (Brown et al., 2009). Some facilitators to implementation of EBP were identified as building a culture that supports involvement of nurses, implementation of evidence that is clinically relevant, and adopting the attitude of putting the patient first (Brown et al., 2009). Research conducted by Ramos-Morcillo and colleagues' supports these findings and further demonstrated the ability to increase nurses' knowledge and skills to read and understand EBP literature (Ramos-Morcillo et al., 2015). However, they were not effective to change nurses' attitudes toward EBP or perceived barriers to clinical implementation (Ramos-Morcillo et al., 2015).

Sustainability and future improvements should focus on reducing perceived time constraints by nursing staff. Introducing streamlined work flow that optimizes the ordering process through the use of bundled order sets may demonstrate increased ATP implementation. The department should expand ED technician's unit based skill competencies to include throat swab specimen collection under the supervision and direction of a nurse. Additionally, staffing should provide the triage nurse with ED technician support for delegation of tasks associated with ATP implementation. Finally, department leadership should consider the impact point-of-care-testing, such as RSTs, may have on laboratory turnaround time, patient length of stay, and patient satisfaction.

Implementation of a throat pain protocol to expedite patient care and reduce patient's length of stay to the 75 minute (median) hospital goal has yet to be utilized to its full potential. While this facility has only partially implemented an ATP for throat pain, the benefits to reduce LWOBS, patient's length of stay, and antibiotic prescribing are evident. The advantages of a throat pain protocol not only provides a uniform approach to assessment and diagnosis, but a clear indication for when to treat with antibiotics. Time savings will vary by protocol; however, any amount of time savings is beneficial to throughput in the ED. Although the results from this study are not generalizable, knowledge gained from this project can inform future improvement in ED operations and investigations of this type.

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Table 1

Definition of Terms

Term	Definition
Advanced Treatment Protocol (ATP)	Guidelines used in the ED authorizing nurses to initiate diagnostic studies or therapeutic interventions for patients with specific complaints in collaboration with ED Attendings based on pre-established criteria.
Antibiotic prescribing	Appropriate prescribing of antibiotics will be determined by a positive RST or throat culture.
Centor criteria*	A clinical scoring tool to assess throat pain and guides diagnostic testing and management.
Left without being seen (LWOBS)	The number or percentage of patient that check into the emergency department for medical care, but leave prior to evaluation by a medical provider.
Length of stay	The number of minutes from patient presentation to triage or arrival by ambulance to documented time the patient left the department.
McIsaac criteria**	A modification to Centor criteria using patient age.

*Centor, R. M., Witherspoon, J. M., Brody, C. E., & Link, K. (1981). The diagnosis of strep throat in adults in the emergency room. *Medical Decision Making, 1* (3), 239-246.

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Table 2

Throat Pain Scoring Based on Centor and McIsaac Criteria

		Points
i.	Temperature > 38°C (100.4°F)	1
ii.	No cough	1
iii.	Tender anterior cervical adenopathy	1
iv.	Tonsillar swelling or exudate	1
v.	Age 3 – 14 years	1
vi.	Age 15 – 44 years	0
vii.	Age ≥ 45 years	-1

Total Score: _____

Note. From "The Diagnosis of Strep Throat in Adult in the Emergency Room," by R.M Centor and J. M. Witherspoon, C. E. Brody, and K. Link, 1981, *Medical Decision Making, 1*(3), 239-246. Adapted with permission. From "Empirical Validation of Guidelines for the Management of Pharyngitis in Children and Adults," by W. J. McIsaac, J. D. Kellner, P. Aufricht, A. Vanjaka, and D. E. Low, 2004, *Journal of the American Medical Association, 291*(13), 1587-1595. Adapted with permission.

Table 3

Description of Patients Presenting to the ED with Throat Pain

		Overall	Testing Not Ordered	Medical Provider Initiated	Nurse Initiated ATP
		(n = 117)	(n = 27)	(n = 67)	(n = 23)
Age (in years)					
	3 to 14	41, 35%	8, 30%	22, 33%	11, 48%
	15 to 44	65, 56%	14, 52%	40, 60%	11, 48%
	> 45	11, 9%	5, 19%	5, 7%	1, 4%
Gender					
	Male	52, 44%	14, 52%	31, 46%	7, 30%
	Female	65, 56%	13, 48%	36, 54%	16, 70%
Race					
	Caucasian	64, 55%	15, 56%	39, 58%	10, 43%
	African American	46, 39%	10, 37%	25, 37%	11, 48%
	Asian	0, 0%	0, 0%	0, 0%	0, 0%
	Hispanic	0, 0%	0, 0%	0, 0%	0, 0%
	Other	7, 6%	2, 7%	3, 4%	2, 9%
Emergency Severity Index*					
	2	2, 2%	0, 0%	2, 3%	0, 0%
	3	17, 15%	9, 33%	7, 10%	1, 4%
	4	98, 84%	18, 67%	58, 87%	22, 96%
Time of Day					
	10:00 – 21:00	75, 64%	14, 52%	43, 64%	18, 78%
	21:01 – 09:59	42, 36%	13, 48%	24, 36%	5, 22%

Note: Number and percentages are given for each data point. Percentages are rounded to the nearest whole number. ATP advanced treatment protocol; LWOBS left without being seen.

* Emergency Severity Index (ESI): A triage tool for emergency departments: DVDs and 2012 edition of the implementation handbook. February 2013. Agency for Healthcare Research and Quality, Rockville, MD. Retrieved from http://www.ahrg.gov/professionals/systems/hospital/esi/index.html

Table 4

Patients that Left without Being Seen After Presenting to the ED with Throat Pain

		Testing Not Ordered	Medical Provider Initiated	Nurse Initiated ATP
		(n = 27)	(n = 67)	(n = 23)
LWOBS				
		0, 0%	2, 3%	0, 0%
Time of Day				
	10:00 - 21:00	NA	0	NA
	21:01 - 09:59	NA	2	NA
LOS (minutes)				
		NA	158	NA
Lost Charges*	Emergency Severity Index**			
	2	NA	NA	NA
	3	NA	$547	NA
	4	NA	$306	NA
	5	NA	NA	NA

Note: Number and percentages are given for each data point. Percentages are rounded to the nearest whole number. ATP advanced treatment protocol; LOS length of stay; LWOBS left without being seen; NA non-applicable.

*Lost charges is revenue the hospital cannot bill for as a result of the patient leaving the ED prior to medical provider assessment. Charges were calculated based on patient level of complexity using data from the facility reimbursement department.

** Emergency Severity Index (ESI): A triage tool for emergency departments: DVDs and 2012 edition of the implementation handbook. February 2013. Agency for Healthcare Research and Quality, Rockville, MD. Retrieved from http://www.ahrg.gov/professionals/systems/hospital/esi/index.html

Table 5

Length of Stay for Patients Presenting to the ED with Throat Pain

		No Testing	Medical Provider Initiated Testing	Nurse Initiated ATP
Number of Patients		(n = 27)	(n = 67)	(n = 23)
	Overall	27	67	23
	10:00 - 21:00	14, 52%	43, 64%	18, 78%
	21:01 - 09:59	13, 48%	24, 36%	5, 22%
Mean (minutes)		(n = 27)	(n = 65)	(n = 23)
	Overall	127	114	108
	10:00 - 21:00	106	102	87
	21:01 - 09:59	149	136	186
Median (minutes)				
	Overall	96	103	92
	10:00 - 21:00	81	97	84
	21:01 - 09:59	119	122	172
Minimum (minutes)		29	33	50
Maximum (minutes)		361	253	307
Range (minutes)		332	220	257

Note: Number and percentage are provided for some data points. Percentages are rounded to the nearest whole number. ATP advanced treatment protocol.

Table 6

Antibiotic Prescription for Patients Presenting to the ED with Throat Pain

		Overall	No Testing	Medical Provider Initiated	Nurse Initiated ATP
		(n = 115)	(n = 27)	(n = 65)	(n = 23)
Antibiotic prescription					
	Overall	65, 56%	19, 70%	35, 52%	11, 48%
	RST/culture +	26, 23%	0	18, 28%	8, 35%
	RST/culture - or no testing	39, 34%	19, 70%	17, 26%	3, 13%
No antibiotic prescription					
	Overall	50, 44%	8, 30%	30, 46%	12, 52%
	RST/culture +	0	0	0	0
	RST/culture - or no testing	50, 44%	8, 30%	30, 46%	12, 52%

Note: Number and percentage are provided for some data points. Percentages are rounded to the nearest whole number. RST/culture positive testing confirms GBS infection; RST/culture negative identifies no GBS bacteria. One RST resulted negative with a positive culture was counted as an overall group B streptococcus (GBS) + test. ATP advanced treatment protocol; RST rapid streptococcus test.

Figure 1. Avedis Donabedian's Nursing Theory. From "The Quality of Care. How Can it be Assessed?" 1997, A. Donabedian, *Archives of Pathology & Laboratory Medicine, 121*(11), 1145-1150.

Appendix A

Evidence Table for Bundled Treatment Protocols in the Emergency Department

Reference (Year)	Purpose	Method / Design Sample	Variables	Outcomes and Results	Level of Evidence *
(ACEP Boarding Task Force, 2008)	Derive expert emergency physician consensus concerning strategies to facilitate patient throughput and improve patient care	Expert consensus panel Includes: Boarding Task Force Members and American College of Emergency Physicians (ACEP) Leadership	ED operational processes: POCT, advanced triage	Methods of improving flow such as point of care testing and allowing nurses to order tests at triage (advanced triage) can decrease triage to discharge time. However the costs to implement these procedures often exceed the amount of savings they generate.	IV
(Retezar et al., 2011)	Evaluate the effect of triage standing orders on treatment time of ED patients	Retrospective nested-cohort study N=15,188 eligible ED patients over a 32 month period at an ED in a Level II academic medical/trauma center	Patients that receive no diagnostic testing, partial triage standing orders or full triage standing orders. Protocols evaluated: chest pain, shortness of breath, abdominal pain, genitourinary complaints	Unadjusted median treatment time savings using triage standing orders: 52 minutes (18% decrease) Adjusted median treatment time savings 16% (95% CI=13% to 18%) Adjusted median time savings was greatest for genitourinary complaints compare to other protocols utilized, 52 minutes or 18% (95% CI=11% to 25%)	II
(Robinson, 2013)	Determine whether protocols can decrease ED length of stay for lower and middle acuity patients; acuity levels 3 and 4 based on ESI criteria**	Integrative review N=8; 3 RCTs, 3 cohort studies, 1 randomized comparison trial, and 1 retrospective chart review Articles included in review published between 2005 to 2010	Length of stay in relation to acuity level (acuity level 3 and 4), various chief complaints, whether a minor procedure was performed, whether a fracture was present.	Use of triage protocols reduced total length of stay from 2.45 to 74 minutes. For orthopedic injuries mean time savings ranged from 2.45 minutes with a procedure to 18.59 minutes without a procedure; from 8.5 minutes for a sprained ankle to 60.5 minutes for a sprained knee; and from 6 minutes for a fracture to 14 minutes without a fracture Time savings based on acuity level ranged from 60 minutes for acuity 4 to 89 minutes for acuity 3	V
(Stauber, 2013)	Determine the difference to ED LOS between patients with abdominal pain who receive advanced nursing interventions and those who did not	Quasi-experimental Retrospective chart review N=243 patients presenting with abdominal pain, assigned acuity level 3 using ESI criteria; 156 in	LOS using advanced nursing intervention for abdominal pain compared to medical provider initiated orders LOS measure by mean time in department and mean time in room	Protocols increased mean time in department 585 minutes compared to 478 minutes without advanced nursing intervention Protocols decreased mean time in room 332 minutes compared to 417 minutes without advanced nursing interventions	III

		the control group, 87 patients in the intervention Conducted in one ED at an academic medical center			
(Welch, 2012)	Synthesize data regarding ED operations	Meta-synthesis Sources: the Emergency Department Benchmarking alliance database, PubMed, Google Scholar, data presented from conferences and proceedings	ED operational processes: low flow/high flow, team triage	Operational intake processes that incorporate patient volume presenting for care and utilization of team triage to perform diagnostic and therapeutic workup during the intake phase, improve ED throughput.	III
(Wiler et al., 2010)	Identify select front-end ED operational strategies with potential for high-impact on patient flow	Literature review N=54 Articles included in review published between 1966 to 2008	Front-end ED operational strategies: advanced triage protocols and triage-based care protocols	Limited published experience using advanced triage protocols exist. Available literature reports advanced triage protocols reduce length of stay. Barriers to standardized implementation need to be addressed. More rigorous multi-institutional, prospective studies are need.	IV

Note: ED emergency department; ESI Emergency Severity Index; LOS length of stay; POCT point-of-care testing.

* Dearholt, S., Dang, D., & Sigma Theta Tau International. (2012). *Johns Hopkins Nursing Evidence-based Practice: Models and Guidelines*.

** Emergency Severity Index (ESI): A triage tool for emergency departments: DVDs and 2012 edition of the implementation handbook. February 2013. Agency for Healthcare Research and Quality, Rockville, MD. Retrieved from http://www.ahrg.gov/professionals/systems/hospital/esi/index.html

Appendix B

Evidence Table for Laboratory Specimen Processing Protocols in the Emergency Department

Reference (Year)	Purpose	Method / Design Sample	Variables	Outcomes and Results	Level of Evidence *
(ACEP Boarding Task Force, 2008)	Derive expert emergency physician consensus concerning strategies to facilitate patient throughput and improve patient care	Expert consensus panel Includes: Boarding Task Force Members and American College of Emergency Physicians (ACEP) leadership	ED operational processes: POCT, advanced triage	Methods of improving flow such as point of care testing and allowing nurses to order tests at triage (advanced triage) can decrease triage to discharge time. However the costs to implement these procedures often exceed the amount of savings they generate.	IV
(Hsiao et al., 2007)	Compare the effects of a POCT versus traditional laboratory testing methods on length of stay in a pediatric ED	Randomized controlled trial N=225 111 patients in the control group; 114 patients in the intervention; conducted in a pediatric, urban setting ED	POCT Traditional (central) laboratory testing	POCT decreased total median LOS by 38 minutes for all patients, (95% CI=14.3 to 55 minutes)	I
(Jang et al., 2013)	Determine whether the use of a comprehensive metabolic panel point-of-care test can reduce ED LOS compared with central laboratory testing	Randomized controlled trial N=10,244 noncritically ill ED patients aged 15 years and older at a single, urban, academic medical center	POCT Central laboratory testing	POCT reduced median ED LOS 22 minutes (95% CI=4 to 40 minutes) POCT reduced LOS for patients treated and released 12 minutes (95% CI= 2 to 22 minutes) POCT reduced LOS 11 minutes to CT imaging	I
(Oredsson et al., 2011)	Evaluate scientific evidence related to interventions that may improve patient flow in Eds	Systematic review N=33 studies including 800,000 total patients; Study quality: 0 high, 22 medium, 11 low Articles included in	POCT	POCT reduced response time 51 minutes (low study quality, high outcome size) POCT reduced LOS by median 21 minutes (minimum 8 to maximum 54 minutes); this effect is supported by limited evidence (low reproducibility and heterogeneity)	IV

		review published between 1966 to 2009			
(Singer et al., 2005)	Determine the effect of cardiac troponin I point-of-care testing to ED LOS in chest pain patients	Before-after interventional study N=368; 232 patients in the before group, 134 patients in the after group over two 2-week periods	LOS in the ED (time from patient triage until the patient left ED to hospital floor)	Use of bedside troponin I point-of-care testing reduced: ED LOS from 7.1 hours to 5.2 hours, mean difference of 1.9 hours (95% CI = 1.1 to 2.7 hours)	II

Note: ED emergency department; LOS length of stay; POCT point-of-care testing.
* Dearholt, S., Dang, D., & Sigma Theta Tau International. (2012). *Johns Hopkins Nursing Evidence-based Practice: Models and Guidelines*.

Appendix C

Throat Pain Protocol

1. Only order Rapid Strep Test (RST) for patients who score **2 or more points** using the Centor (and McIsaac) criteria. (Centor et al., 1981; Fine et al., 2012; McIsaac et al., 1998; McIsaac et al., 2004)

    a. Criteria — Point(s)
        i. Temperature > 38˚C (100.4˚F) — 1
        ii. No cough — 1
        iii. Tender anterior cervical adenopathy — 1
        iv. Tonsillar swelling or exudate — 1
        v. Age 3-14 years — 1
        vi. Age 15-44 years — 0
        vii. Age ≥ 45 years — -1

    Total Score: _____

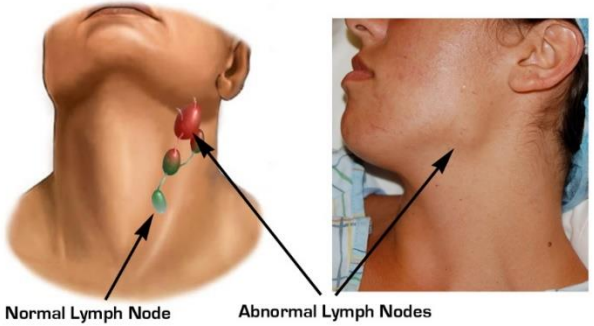
2. Rapid Strep Test specimen collection
    a. Use the two-swab specimen process provided in the kit
    b. Collect RST and throat culture specimens
    c. Send RST and throat culture specimens to lab

Appendix D

Throat Pain Protocol

1. Only order Rapid Strep Test (RST) for patients who score **2 or more points** using the Centor (and McIsaac) criteria.
2. Criteria: Points
   a. Temperature > 38˚C (100.4˚F) 1
   b. No cough 1
   c. Tender anterior cervical adenopathy 1
   d. Tonsillar swelling or exudate 1
   e. Age 3-14 years 1
   f. Age 15-44 years 0
   g. Age ≥ 45 years -1

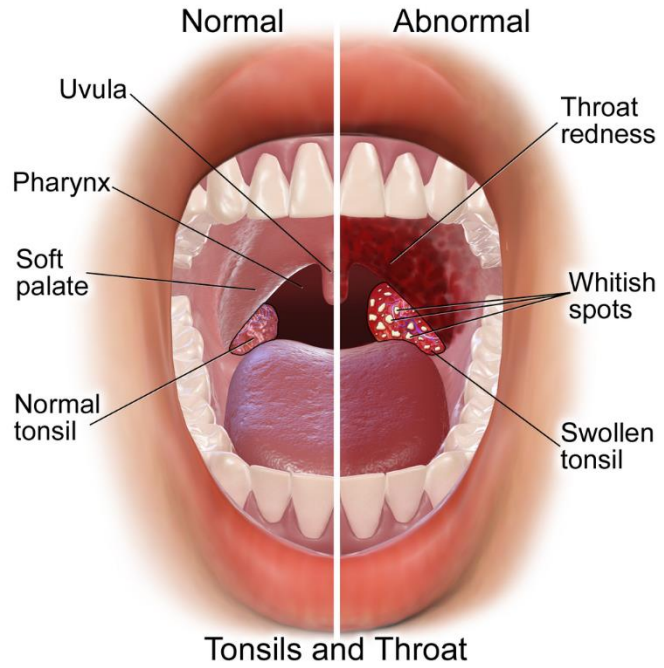
   Total Score: _____
3. Rapid Strep Test specimen collection
   a. Use the two-swab specimen process provided in the kit
   b. Collect and send RST and throat culture specimens to lab



Sterling, J. (2014). Straight, No Chaser: Here's When Your Sore Throat Needs Antibiotics – The Centor Criteria. Retrieved from http://jeffreysterlingmd.com/tag/lymphadenopathy/

General principles for specimen collection:

1. If collecting RST and culture, collect both swabs simultaneously.
   a. If RST is positive, culture can be discarded. If RST test is negative, the second swab can be used for culture.



Wikipedia. (2014). Tonsillitis. Retrieved from http://en.wikipedia.org/wiki/Tonsillitis

2. Ask the patient to say "ahhhh" (to raise the uvula and visualize the tonsils)
   a. Children can be asked to "pant like a dog"
3. Specimens should be obtained from vigorously touching both tonsils (or tonsillar fossae for patients who have had tonsillectomy) and posterior pharynx
   a. "Gentle" swabbing does not provide adequate specimen
   b. Swab obvious signs of pus
4. Be sure not to touch the buccal surface (inside of cheek), lips, teeth or tongue
   a. Sensitivity of the tests is dependent on the quality of the specimen collected

58

Selected Laboratory Tests		
Name of Test	**Type of Test**	**Sensitivity and Specificity**
Throat Culture	- Gold standard - Back-up test if RST is negative (particularly for children and adolescents) - Specimen obtained by throat swab of posterior tonsillopharyngeal area and inoculated onto 5 % sheep-blood agar plate to which a bacitracin disk is applied - Result in 24 to 48 hours	- Sensitivity: 90 to 95% [1] - Specificity: 99% - Results dependent on the technique, medium, and incubation
Rapid antigen detection test or rapid streptococcal antigen test (RST)	- Detects presence of group A streptococcal carbohydrate on a throat swab (change in color) indicates a positive result) - Results available within 5-10 minutes - Point-of-care test	- Specificity: > 95% [1] - Sensitivity: 80 to 97% - Results dependent on the individual test

[1] Wald, E. R. (2015). Approach to diagnosis of acute infectious pharyngitis in children and adolescents. UptoDate.

Appendix E

DX (viral): acute pharyngitis, acute viral pharyngitis, viral pharyngitis

DX (bacterial): acute streptococcal pharyngitis, acute baterial tonsillitis, acute tonillitis, strep throat, exposure to strep throat, exudtaive pharyngitis, scarlet fever

CC: throat pain, sore throat

Chart Number	Age	Gender	Race	Acuity Level	Centor Score	Time	LWOBS	LOS (mins)	Testing Ordered	Testing Ordered by	RST Lab Result	Throat Culture Ordered	Throat Culture	Abx
	>3y/o	1= M, 2 = F	1= Caucasian 2 = African American, 3 = Asian, 4 = Hispanic, 5 = Other	ESI 1-5	0 - 5; 6= NA	1=10:00-21:00, 2= 21:01-9:59	1= Yes, 2 = No	Mins	1= Yes, 2 = No	1=Medical provider, 2=Nursing: 3= NA	1= +, 2 = - , 3= NA	1= Yes; 2 = No; 3 = NA	1= +, 2 = - ; 3= NA	1= Yes, 2 = No
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Appendix F

6/18/2015 Print

Subject: Re: Centor Criteria: Capstone Project
From: Robert M Centor (rcentor@uab.edu)
To: dchris344@yahoo.com;
Date: Thursday, June 4, 2015 1:48 PM

Sounds interesting and you do not need my permission. The scoring criteria is not owned – it was published in 1981 and is usable by anyone.

==========

Robert M Centor, MD, MACP

Regional Dean, UAB Huntsville Regional Medical Campus
301 Governors Drive
Huntsville, AL 35801

Office: 256-539-7757
Fax: 256-551-4451

Chair-Emeritus, ACP Board of Regents

Professor, General Internal Medicine
UAB
FOT 720
1530 3rd Ave S
Birmingham, AL 35294-3407

From: Deanna <dchris344@yahoo.com>
Reply-To: Deanna <dchris344@yahoo.com>
Date: Thursday, June 4, 2015 at 10:27 AM
To: ROBERT CENTOR <rcentor@uab.edu>
Subject: Centor Criteria: Capstone Project

Dr. Centor,

I am seeking permission to use your Centor Scoring Criteria in conjunction with the McIsaac Score in a Capstone project I will be performing this fall, 2015. I am a Doctor of Nursing Practice Student at the University of Virginia interested in the effect advanced treatment protocols may have on patient throughput. ED crowding, delayed patient throughput and increased patient's length of stay is a significant issue in the United States. While ED crowding has had minimal impact on wait times for high acuity, resource-intensive patients, the same has not been true for lower acuity, less resource-intensive such as patients with throat pain.

I plan to use Centor Criteria to establish a nurse driven triage protocol that authorizes nurses to collect rapid strep testing so that laboratory results may be available for physician review when treatment space is available. The purpose of the study is to evaluate the use of an evidence-based protocol for

Subject: RE: Capstone Project: modified Centor Criteria

From: McIsaac, Dr. Warren (wmcisaac@mtsinai.on.ca)

To: dchris344@yahoo.com;

Date: Thursday, June 18, 2015 4:45 PM

Hi Deanna,

Sorry for the delay. Thanks for asking but the information

is public access and I think should be useable. I believe the Canadian Medical Association

Journal has the copyright if you were planning to use the published figure though.

I would just suggest to be sure to take advantage of the limitations. In particular, the score performance

changes if the prevalence of GAS changes beyond 10%-20%. Dr. Centor's original paper in an emerg setting had a prevalence of

25% I believe and that would affect the modifications I made. Also, it is not just the score but the link to management

recommendations which is key in my view.

I have persistently tried to popularize the use of the name 'modified Centor score' for what

I did, as the core was Dr. Centor's original score and we found age-modification and slight tweaking of one criteria allowed its use in primary care (non-emergency though)settings

and for both children and adults, where as Dr.Centors' work had only been developed for adults. If Dr. Centor is still at U of Virginia he

may have additional insights.

Best of luck with the study.

W.McIsaac

From: Deanna [mailto:dchris344@yahoo.com]

Appendix G

UNIVERSITY of VIRGINIA IRB-HSR

Institutional Review Board for Health Sciences Research

DETERMINATION OF UVa AGENT FORM

INFORMATION ABOUT THIS FORM

- This form is to determine if UVa personnel are or are not considered to be working as an Agent* for UVa on this project.
- If it is determined that UVa personnel are considered to be working as an Agent* for UVa the study team will be required to submit an additional submission to the IRB-HSR, unless the project is determined to not involve human subject research. See Determination of Human Subject Research Form

*Agent- all individuals (including students) performing institutionally designated activities or exercising institutionally delegated authority or responsibility.

Enter responses electronically. Email the completed form to IRBHSR@virginia.edu for pre-review.
An IRB staff member will reply with any changes to be made.

Name of Individual to be Working on Project:	Deanna Settelmeyer
Email:	drs5eq@virginia.edu
Phone:	(808) 347-0755
UVa Messenger Mail Box #	N/A
Project/Protocol Title if Known:	☐ Unknown or Title: Evaluation of Emergency Department Throat Pain Protocol to Reduce Number of Left without Being Seen, Length of Stay, and Antibiotic Prescribing
Explain your role in the project: (200 words or less)	Doctor of Nursing Practice Candidate working on Capstone project - project designed, data collector, analyzer
Explain the reason for traveling to the outside institution.	Clinical Expert is located at Martha Jefferson Community Hospital Emergency Department and is the co-sponsor of this project

1. Answer the following questions:

☒Yes ☐No I was involved in the design of this research project.
☐Yes ☒No A UVa IRB has approved this research. IRB-HSR # [redacted]
☐Yes ☒No Funding to conduct this research will come from UVa.
☐Yes ☒No The only reason I am traveling to this outside institution is to work on this research.
☒Yes ☐No Working on this research is required for my degree program.

2. I confirm that

☒Yes ☐No I am a student, employee or faculty member of the University of Virginia.
☒Yes ☐No My work on this project will be overseen by the Principal Investigator and the IRB at the outside institution. This includes completing any training in human subject research protection as required by the outside IRB.
☒Yes ☐No I will communicate with the IRB and the Contracts Office, to determine what approvals may be needed, prior to receiving any data from the outside institution.

OR

3. **I confirm that :**

☒Yes ☐No I designed this research.
☒Yes ☐No I am a student, employee or faculty member of UVa but am employed by another institution.
☒Yes ☐No All subjects will be enrolled at this outside institution and all data will remain there.
☒Yes ☐No The research will be overseen by their IRB and, if applicable, their HIPAA Privacy Board. This includes completing any training in human subject research protections as required by the outside IRB.
☒Yes ☐No There is no funding for this study or if there is funding, it will be handled by the non-UVa institution at which I am employed.
☒Yes ☐No I have notified the outside IRB that a UVa IRB will not be overseeing my work. ATTACH COPY OF OUTSIDE IRB APPROVAL.

FOR IRB-HSR OFFICE USE ONLY

☒ UVa personnel are not considered to be working as an Agent for UVa on this project.
No approvals from the UVa IRB-HSR are required.
UVA Tracking # 18364

☐ UVa personnel are considered to be working as an Agent for UVa on this project.
Submit a research application to the UVa IRB-HSR.

Susie Hoffman — Signature of IRB Chair, Director or Designee
8/24/15 — Date

500 Martha Jefferson Drive
Charlottesville, VA 22911

All Departments
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(800) 633-6353 Toll Free
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(434) 654-7009
(888) 652-6663 Toll Free

Martha Jefferson Hospital

Deanna Settelmeyer, DNPc, RN, CEN
3975 Rock Branch Road
North Garden, VA 22959

August 18, 2015

Dear Deanna,

Regarding the study "Evaluation of Emergency Department Throat Pain Protocol to Reduce Number of Left without Being Seen, Length of Stay, and Antibiotic Prescribing" which was submitted to the Martha Jefferson IRB for consideration on July 8, 2015, the board has determined that it meets exempt status and will not require IRB oversight.

The condition of exempt status is that you will be rigorous about the protection of Personal Health Information (PHI) and, as indicated in your application, de-identify any PHI which is collected.

Thank you for your submission. If you have any other questions, please contact me at 434 654-8405.

Sincerely,

Faye Satterly, BSN, RN, MFA
Chair, Martha Jefferson IRB

Appendix H

Manuscript preparation guidelines for the *Journal of Emergency Nursing*:

http://www.jenonline.org/content/authorinfo

Appendix I

Evaluation of an Evidence-based Throat Pain Protocol to Reduce Left Without Being Seen, Length of Stay, and Antibiotic Prescribing

Deanna Settelmeyer, DNP, RN, AGCNS-BC, CEN
University of Virginia
School of Nursing
Charlottesville, VA
Mr. Jefferson's ENA

Deanna Settelmeyer (corresponding author)
Permanent address:
1025 Lochaven Ave
Springfield, OR 97477
(808) 347-0755
drs5eq@virginia.edu

5 reprints requested

Abstract

Background: Increasing numbers of people are seeking unscheduled, medical care in United States' emergency departments which contributes to delayed throughput and increased patient's length of stay. Implementation of advanced treatment protocols such as a throat pain protocol initiates early diagnostic testing, optimizes patient throughput strategies, and promotes adherence to clinic practice guidelines for an additional segment of patients.

Aim: To evaluate the effect of an evidence-based throat pain protocol.

Methods: The medical records for 117 patients presenting with throat pain to the emergency department were reviewed and separated into three groups: no testing, medical provider initiated testing, or nurse initiated testing. Main outcome variables were number of patients that leave without being seen, patient's length of stay, and antibiotic prescribing.

Results: No patients left without being seen from the nurse initiated testing group or no testing group compared to 3% from the medical provider initiated group. By eliminating these left without being seen patients, there is a potential cost savings of $3,420 over a 12 month period. The overall mean length of stay was six minutes shorter in the nurse initiated group than the other two groups evaluated. Antibiotic prescriptions were given for 48% of patients in the nurse initiated group compared to 52% in the medical provider group, and 70% in the no testing group.

Conclusion: While this department has only partially implemented an advanced treatment protocol for throat pain, it highlights the benefits to reduce the number of patients that leave without being seen, patient's length of stay, and antibiotic prescribing.

Keywords: protocol, standing order, emergency services, left without being seen, length of stay

Evaluation of an Evidence-based Throat Pain Protocol to Reduce Left Without Being Seen, Length of Stay, and Antibiotic Prescribing

The emergency department may be distinguished from other areas in health care by a wide range of patient acuity that presents for unscheduled medical care in an environment of competing priorities and fixed number of resources. While high acuity patients who require immediate and/or life sustaining medical intervention have not experienced increased wait times for receipt of care, this same trend has not been true for lower acuity patients.[1,2] In fact, the literature reports patients designated lower acuity are subjected to the longest length of stay with diagnostic imaging and laboratory tests associated with the longest increases.[2]

ED patients with a chief complaint of throat pain present a unique challenge to patient throughput related to assignment of low acuity and the potential for additional time required for specimen processing. Due to the nonspecific clinical features of group A streptococcal (GAS) pharyngitis, authorities have generally recommended laboratory confirmation of the presence of GAS before treatment with antibiotics.[3-7] However, literature reports many providers prescribe empiric antibiotic treatment based on symptoms alone, often over-prescribing without confirmation of infection, and that accurate diagnosis on the basis of clinical grounds alone is usually impossible.[5,6,8]

In the emergency department, ATPs allow nursing staff to initiate appropriate diagnostic, therapeutic, and patient management regimens before provider examination for specific patient presentations. The purpose of this project was to evaluate the use of an evidence-based protocol for patients presenting to the emergency department with throat pain to determine the effect on the number of patients that left without being seen (LWOBS), patient's length of stay, and appropriate antibiotic prescribing.

Methods

An evidence-based project was conducted to examine the effect of an ATP for throat pain. The intervention took place in a not-for-profit, community hospital with 176 licensed inpatient beds located in Central Virginia. The emergency department has 29 staffed treatment beds that provide non-trauma, emergency and medical services for approximately 50,000 ED visits annually. This emergency department has two treatment areas. The main emergency department is open 24 hours a day and provides treatment to all acuity levels; the ancillary treatment area is designated for minor emergency care (MEC) and operates during historically high volume of patient census. The MEC area comprises six of the available treatment beds and is staffed by one nurse practitioner or physician assistant between 11:00 to 21:00 daily.

A convenience sample was drawn from all ED patients, three years of age and older, who presented for medical care during a 90 day time period. Patients were identified through a medical records search. Chief complaints of throat pain and sore throat were included if the diagnosis was listed as one of the following: acute pharyngitis, acute viral pharyngitis, viral pharyngitis, acute streptococcal pharyngitis, acute bacterial tonsillitis, acute tonsillitis, strep throat, exposure to strep throat, exudative pharyngitis, or scarlet fever. Centor and McIsaac criteria are not validated for use in children under the age of three.[6]

Procedures

During the training period, approximately 81% of nurses working in the emergency department who provide bedside care or assignment to the triage area were trained to the use of the ATP for throat pain in small groups and/or one-on-one. Visual aids and reference handouts were designed to train staff to correctly assess Centor and McIsaac criteria, specimen collection

technique, and documentation of the throat pain score. The handout was emailed to all ED staff who provide bedside care with a copy of the training readily available for clinical reference.

The investigator identified medical records for inclusion using the reports generator feature in the electronic medical record (EMR). Reports were generated using the documented chief complaint and diagnosis to identify a greater number of eligible records. An Institutional Review Board waiver was obtained prior to project procedures.

Measures

Following protocol implementation, demographic measures were collected from eligible medical records as well as outcome data points. Time of patient arrival was grouped by two categories: MEC hours of operation including one hour before opening (10:00 to 21:00), and non-operating hours of the MEC (21:01 to 9:59).

Centor and McIsaac scoring criteria were used to assess and grade throat pain. Numerous professional organizations endorse the use of the Centor clinical scoring scale to assess the risk of GAS and guide management.[3,5] The Centor score is a validated measure that aids clinicians to distinguish GAS from viral pharyngitis.[3,8] The 4-point Centor score calculates the likelihood of GAS infection and guides management by assigning one point for each of the following: (a) fever, (b) absence of cough, (c) presence of tonsillar exudates, and (d) swollen, tender anterior cervical nodes.[9] McIsaac criteria is a validated measure that was added to Centor criteria to adjust the score based on patient age.[3,8,10] One additional point is assigned for patient age 3 to 14 years, no points for age 15 to 44 years, and subtract one point for patient age 45 years and older.[4,10] Permission to use Centor and McIsaac assessment scoring criteria was granted by the authors. For this project, a score of two points was used for the decision point to collect rapid streptococcal test (RST) specimens.

Data Analysis

Microsoft Excel 2013 v.14.0 data package was used to analyze the data. Medical records were separated into two groups: *testing* and *no testing*. The testing group was subcategorized as testing initiated by nursing using the ATP or medical provider. ATP use is defined by the ordering and collection of RST and/or throat culture specimens by nursing staff. This is a quality improvement project that did not intend to perform statistical analysis. Instead, descriptive statistics were used to describe trends in data. Patients that LWOBS were excluded from variables with missing data points. A cost analysis was calculated using the number of LWOBS during the three month data collection period multiplied by four to determine the hospital's potential cost savings over a year.

Results

A total of 117 patients who presented to the emergency department during the study period met inclusion criteria. Two patients LWOBS after spending an average of 2 hours and 38 minutes in the ED (see Table 1). Both patients received RST ordered by a medical provider while waiting for assessment and treatment by a medical provider, and both patients presented for medical care when the MEC was closed. There were no LWOBS in the no testing or nurse initiated protocol groups.

Based on data received from the hospital's financial reimbursement department, a patient with Emergency Severity Index (ESI) level three has a $547 baseline treatment charge for direct and indirect costs associated with the patient visit. A patient with ESI level 4 has a $306 baseline charge. Using this data, patients who LWOBS during the study period resulted in $855 lost charges. Assuming a similar pattern of LWOBS over a period of 12 months for patients with

throat pain and full payment for the dollar amount charge, there is a potential cost savings of $3,420, if LWOBS is eliminated.

Overall, patients with throat pain spent an average of 115 minutes in the emergency department from arrival to documented discharge. Nursing application of the ATP resulted in the shortest mean length of stay overall, 108 minutes compared to 114 minutes for medical providers, and 127 minutes in the no testing group. Patients that had treatment initiated by the throat pain protocol demonstrated the longest length of stay when the MEC area was closed. Medical provider initiated testing resulted in the smallest range for length of stay, and no testing resulted in the largest range. The minimum length of time (shortest) spent in the emergency department, with the greatest efficiency for treating and releasing patients under various department conditions was seen in the no testing group, medical provider initiated testing, and nurse initiated testing respectively.

Sixty-five patients (56%) were treated for GAS induced throat pain. Of these patients, 26 (23%) had laboratory confirmed GAS infection. The remaining 39 (34%) were prescribed antibiotics with negative or no testing. Patients in the ATP group received fewer prescriptions for antibiotics, 48% compared to 52% in the medical provider group, and 70% in the no testing group.

Discussion

When an ATP for throat pain was implemented by nursing in the emergency department of a 176-bed community hospital, patients' mean length of stay was shorter than those patients who had testing initiated by medical provider and those who did not receive testing. While patients treated by the nurse initiated group had greater variability in the total length of stay than for those treated by the medical provider initiated testing group, this was likely complicated by

available treatment space once laboratory testing had resulted (e.g. when the MEC was closed). The only group with patients that LWOBS were in the medical provider initiated group. Additionally, adherence to clinical guidelines for antibiotic prescribing was greatest for those who had treatment initiated by nursing. The use of an ATP for throat pain to reduce patient's length of stay is clinically significant because it facilitates delivery of prompt medical care and draws the amount of time used to evaluate and treat patients closer to institutionally set goals for the treatment. However, its intended function may be hindered by factors beyond the scope of this project.

While the overall length of stay was shortest for the nurse initiated ATP group, data limited by when the MEC area was closed resulted in the longest mean length of stay for patients in the ATP group. This increased length of stay may reflect the lower acuity assigned to patients presenting with throat pain when other more critically ill patients were occupying available treatment space. When the MEC was closed, no testing was the most common diagnostic regimen for throat pain.

It is clinically significant that no patients from the ATP group and no testing groups had no LWOBS compared to two patients from the medical provider group. It is unknown how long these patients waited for medical care after the triage process to collection of throat specimens. This finding is consistent with research conducted by Arendt et al (2003) who identified 70.1% of patients that LWOBS would have remained in the emergency department if there had been the availability of immediate temporary treatments such over the counter pain medication.[11] It is possible that medical providers were ordering throat specimens prior to assessment of the patient when bed space had reach its maximum capacity, an ideal time for nurses to initiate ATPs.

While clinical judgement may guide medical provider practice, the number of antibiotic prescriptions written as a result of parent/patient pressure is unknown. One study conducted by Linder and colleagues reported that only 53% of physicians tested for GAS, but 51% of patient visits for throat pain resulted in a prescription for antibiotics.[12] This high rate of antibiotic over prescribing is consistent with all age groups, including children (ages 18 and under) who are reported to have the highest prevalence (37%) of GAS.[7] In comparison, a similar age group (ages 3 to 18) from this study had confirmed GAS positive culture in 16 cases (31%) with antibiotic prescriptions given for 26 cases (50%). During this study, antibiotics were prescribed based on symptoms alone without laboratory confirmation of the presence of GAS, a practice that is generally not recommended.[3-6,8]

Barriers to Implementation

Implementing ATPs is a significant undertaking by ED nurses. There is the added responsibility for nurses to calculate and document the throat pain score as well as order and collect throat specimens in an environment of competing priorities. At this facility an ED technician is often assigned to the triage area for delegation of tasks from the triage nurse to initiate ATPs. However, collection of throat specimens is currently limited to nursing staff only, which adds to the demands on nursing. In addition, the testing and management for strep throat is controversial among medical providers and the individual provider preference to test or not test was not assessed prior to project implementation.

Future improvements should focus on increasing adherence to the protocol by expanding ED technicians' competency based training to include throat swab collection when they already perform more invasive procedures such as phlebotomy. Bundled order sets in the EMR may improve adherence by streamlining workflow. Additionally, a dedicated ED technician to

support triage protocol implementation may improve protocol adherence. Emergency departments should also consider the impact point-of-care-testing, such as RSTs, may have on laboratory turnaround time, patient length of stay, and patient satisfaction.

Strengths and Weaknesses to the Project

There are several strengths to the project. Nursing staff assigned to triage at this facility have a minimum of one year ED experience which may assist nursing to anticipate and implement appropriate ATPs early in the treatment regimen. Additionally, the use of protocols is an accepted part of clinical practice that staff report as beneficial to patient throughput.

This project is limited by the accuracy and completeness of documentation and coding in the EMR. It is possible that some charts coded with a diagnosis of pharyngitis and had negative RST and/or throat culture were prescribed antibiotics for other medical conditions associated with throat pain (e.g. upper respiratory infection, or sinusitis). Adherence to all aspects of the ATP, primarily documentation of the throat pain score, is also a limitation. In addition, the discussion between medical provider and patient, on when and whether to use antibiotics or swab for a throat specimen, is not reflected.

In the emergency department, prioritization of patient care is a constantly evolving phenomenon that cannot be well predicted. With increasing wait times across the country, it is important to investigate all time-saving strategies that have the potential to improve ED throughput. While this facility has only partially implemented an ATP for throat pain, the benefits to reduce LWOBS, patient's length of stay, and antibiotic prescribing are evident. The advantages of a throat pain protocol not only provide a uniform approach to assessment and diagnosis, but a clear indication for when to treat with antibiotics. While the results from this

study are not generalizable, knowledge gained from this project can inform future improvement in ED operations and investigations of this type.

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Table 1

Results of an ED Throat Pain Protocol to Reduce Number of Left Without Being Seen, Length of Stay and Antibiotic Prescribing

		Testing Not Ordered	**Medical Provider Initiated**	**Nurse Initiated ATP**
		(n = 27)	(n = 67)	(n = 23)
LWOBS		0, 0%	2, 3%	0, 0%
		(n = 27)	(n = 65)	(n = 23)
Mean Length of Stay (minutes)		127	114	108
Antibiotic Prescribing	Overall	19, 70%	35, 52%	11, 48%
	RST/Culture +	0	18, 28%	8, 35%
	RST/Culture – or no testing	19, 70%	17, 26%	3, 13%

Note: Number and percentages are given for some data points. Percentages are rounded to the nearest whole number. ATP advanced treatment protocol; LWOBS left without being seen.