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Pain Management in Triage and Reducing Percentage of Left without Being Seen in an Overcrowded ED

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UNIVERSITY OF SAN DIEGO

Hahn School of Nursing and Health Science

DOCTOR OF PHILOSOPHY IN NURSING

PAIN MANAGEMENT IN TRIAGE AND REDUCING PERCENTAGE OF LEFT

WITHOUT BEING SEEN IN AN OVERCROWDED ED

by

Christina Ballejos-Campos

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Abstract

Although in most emergency rooms, the patient is seen first by a highly trained triage nurse, the ED physician is trained to determine if the patient can safely leave the ED prior to in-depth exam, treatment and diagnosis. The goal is to keep the left without being seen by a physician percentage low, since a high number would indicate poor quality, additionally patients who present with pain, and then leave the ED prior to being seen can pose a greater risk.

This study examined the association of nurse-initiated triage pain protocol on the LWOBS percentage rate of patients who present with a chief complaint of pain in an urban ED located in Southern California, and to identify whether LWOBS can be predicted from the knowledge of an individual's risk factors (age, gender, race/ethnicity), pain severity, pain protocol, and wait time.

A test of the full model against a constant only model was statistically significant. Hosmer-Lemeshow test indicated the model was a good fit to the data, and prediction success overall was 86.2%. The most important patient characteristics associated with disposition were treatment in triage and treatment order entry by provider. Treatment in triage was significantly associated with being seen by a physician. These significant findings reflect 94.2% patients who stayed to be seen by the provider were treated in triage for pain. Treatment by provider order entry was highly significant. Results indicate that there is an association between the treatment order entered by provider and if they stayed to be seen. The findings reflected that 71.6% of those who stayed to be seen were treated in triage with an order placed by the physician prior to seeing the physician. Age and gender were not associated with being seen. There was a significant

relationship between race/ethnicity and being seen. And this study saw a relationship between LOS and seen.

In conclusion, being seen and treated by the physician can decrease the number of return visits through evaluation and referral for underlying etiology of pain. Additional practice implications can include strategies aimed at effective pain management in triage and its impact on length of stay.

ACKNOWLEDGEMENTS

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CHAPTER 1

INTRODUCTION

Left without being seen (LWOBS) rates is a patient risk that has been studied extensively and a key quality indicator for the emergency medicine provider. Left without being seen is defined as those who leave the ED without being seen by a physician or physician extender. This quality indictor is measured to determine the percentage of patients who leave prior to seeing the physician or physician designee. Although in most emergency rooms, the patient is seen first by a highly trained triage nurse, the ED physician is trained to determine if the patient can safely leave the ED prior to in-depth exam, treatment and diagnosis. The goal is to keep the left without being seen by a physician percentage low, since a high number would indicate poor quality and would put the patient at potential risk of injury or death (Asaro, Lewis, & Boxerman, 2007; Liao, Liaw, Hu, Le, Chen, & Wang, 2002). Increased wait times to see a physician has contributed to increased LWOBS rates, albeit the evidence has shown that the risk of leaving the ED is dependent of severity of illness and other predisposing factors, the literature has shown that reducing these rates saves lives.

Oligoanalgeisa, or the under treatment of pain, is another challenges that emergency departments face nationally. Although patients visit the ED for various reasons, the literature supports that the most common chief complaint is acute pain (Todd, 2004). Due to overcrowded conditions, patients in acute pain may experience a delay in care and reduced patient satisfaction. Prompt assessment and treatment of pain is best clinical practice and can reduce patient risks (Pines & Hollander, 2008). Despite overwhelming evidence that Emergency Department (ED) overcrowding can lead to untoward events, the number of patients expected to wait for care continues to grow. Overcrowding has caused emergency departments to become creative in how they care for patients in pain. Advance treatment protocols, or ED standard protocols, allow ED nurses to initiate orders for labs, x-rays, treatments, and medications for patients without a written order from a physician. Conventional, standard protocols have been used in EDs for many years, however considering the current phenomenon of overcrowding, it is important to examine the use of ED standard protocols and their effect on the significant patient outcome of LWOBS rates.

The purpose of this study is to examine the impact of a nurse-initiated pain protocol (narcotic) in triage on nurse-sensitive patient outcomes, specifically LWOBS. The specific aims to be addressed are to:

Aim 1. To characterize patients who present for ED services with a chief complaint of pain.

Aim 2. To examine the incidence of patients presenting for ED services with a chief complaint of pain and LWOBS.

Aim 3. To explore factors related to the probability for LWOBS in ED patients experiencing pain.

Conceptual Framework

Donabedian Conceptual model provides a framework to link the structure and process efforts with the desired outcome. Of these desired outcomes, prompt treatment of acute pain in emergency patients and lower LWOBS rates are the most challenging to achieve in an overcrowded ED. Donabedian (1988) opposed the idea of traditional measurement of health care quality, and advanced the idea that quality improvement measures revolve around the concepts of structure, process, and outcome. Structure and process provide the cornerstone for quality patient care and a systematic measure of patient outcomes. A standardized pain assessment and treatment protocol in an overcrowded ED provides the structure and process to effectively examine the effects of quality care. Prompt treatment of pain and reduced LWOBS rates are an important predictor of clinical outcomes; and studies indicate the more overcrowded the ED, the more likely patients would not receive quality care (Pines & Hollander, 2008).

Donabedian (1988) makes the following point about the quality care: "knowledge about the relationship between structure and process (or between structure and outcomes) proceeds from the organizational sciences." According to the Donabdian's model, structure refers to the physical setting such as facility; human resource refers to the number and qualifications of personnel, whereas organizational structure refers to what methods and processes. This study proposes to examine a structure and process developed to treat acute pain promptly and successfully assess whether structure and

process effected left without been seen rates. Based on Donabedian's model, standard

pain protocol provide structure and process for ED triage nurses to utilized clinical

judgment and knowledge by shifting the responsibility of treatment and initiation of pain

management to the ED triage nurse.

Figure 1

Donabedian Conceptual Model
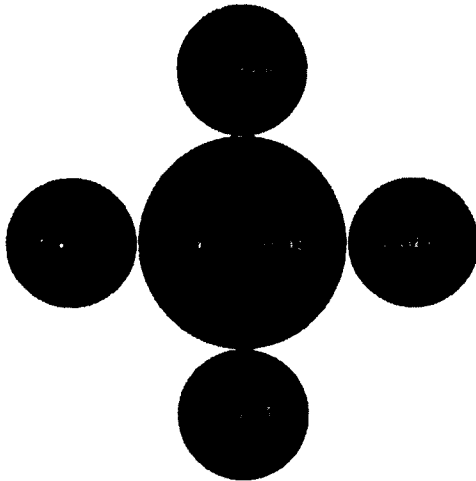
Implications for Nursing Practice, Education, and Research

Leaders within the healthcare organizations struggle with management of ED

overcrowding which result in increased length of ED stays, and the provision of less than

quality care. LWOBS increases the risk for patient injury, re-hospitalization, and even

death. LWOBS prevention for populations known to be high risk is not only cost

effective but also sensitive to the community's unique healthcare needs. Although the

literature has not empirically linked oligoanalgesia to ED overcrowding or increased

LWOBS rates, it can be hypothesized that patients most likely to leave the ED are those

with unrelieved pain in an overcrowded environment. EDs are challenged with timely and effective treatment of pain, while providing a safe structure in which to provide this care. Standardized pain protocols allow specialized nurses to initiate treatment protocols and order pain medications without physician's orders, thereby reducing time to pain management and potentially reducing LWOBS rates. Implications for emergency nursing practice are twofold; (1) providing a process for triage nurses to promptly and effectively treat acute pain while providing the structure to safely administer this treatment, and (2) enabling nursing the autonomy to initiate pain protocols. Findings may guide more targeted prevention for those identified at risk, as well as stimulate similar research in other geographical locations to see if the findings can be replicated. Additionally this study can foster research aimed at testing whether nurse initiated medication pain management can be safely administered.

CHAPTER 2

REVIEW OF THE LITERATURE

Asplin's (2006) commentary on overcrowding focused on solutions related to ED throughput. The numbers of boarding patients, increased wait times, and the time to see an ED physician are factors that significantly affect ED throughput. Ineffective throughput due to ED overcrowding, has a direct impact on LWOBS rates. In addition, patients who leave the ED prior to ED physician consultation are clearly dissatisfied with the care they have received, or the time they waited to receive that care (Asaro, Lewis, & Boxerman, 2007). According to Asaro and colleagues (2007) most patients who leave the ED are not acutely ill, however a small percentage of patients have an emergent illness that if left untreated can result in injury or death. Since leaving the ED before examination by a physician carries an increased risk to the patient, the goal is to reduce the LWOBS rates. It has been hypothesized that one way to reduce the LWOBS rate is by quickly triaging and using ED triage protocols to treat specific chief complaints (Asaro, Lewis, & Boxerman, 2007). This premise is based on the theory that if the ED controls what happens in the front end of the ED, ultimately the impact will be felt in the back end, and ED throughput.

LWOBS and Patient Characteristics

One issue that has impacted emergency medicine is the patient that leaves without being seen by a physician. The current body of knowledge points to LWOBS as an indicator of quality care in emergency medicine and there is compelling evidence that ED overcrowding affect the LWOBS rates (Asaro, Lewis, & Boxerman, 2007). Earlier studies concluded that there was little evidence to describe characteristics of patients who leave the ED without being seen by a physician. Gibson, Maiman, & Chase (1978) and Dershewitze and Paiche (1986), found the patient who left emergency departments were patients who had developed symptoms right before their ED visit. Patients who left were patients who did not wait very long and often did not seek additional medical assistance forty-eight hours after leaving the ED (Dershewitze & Paiche, 1986). This supported the premise that patient who left without being seen by a physician were patients who did not require emergency medical services.

Baker and associates (1991) conducted one of the first studies aimed at defining patient characteristics of those who left prior to being seen by a physician. Findings revealed there was no "characteristic" commonality in patients who left without being seen; men were more likely to leave, however age, race, and insurance status was not a factor. The most common chief complaint was abdominal pain and musculoskeletal pain, but there were no difference detected in health status scores or patient acuity in the patients who left as compared to patient who waited (Baker, Stevens, & Brook, 1991). Contrary to previous studies, patients who left the emergency department without being seen were very sick and required hospitalization after returning to the ED.

Mohsin, Forero, Leraci, Bauman, Young, and Santigo (2007) found patients who leave an emergency department before being seen by a physician varied sociodemographically. Their study was conducted in a large emergency department with a sample size of 14, 741 patients: 8.6% of patients left the emergency department without being seen by a physician. Approximately 36% of patients who left were contacted for follow up. The results of bivariate and multivariate analyses concluded that young patients aged 0–29 years, those with longer waiting time for triage, and those triaged as "less urgent" were more likely to leave than others (Mohsin et al., 2007). Overcrowding in the emergency department had a significant association with LWOBS rates. Of the 36% interviewed, most stated prolonged waiting times were the most common reasons for leaving emergency departments without being seen by a physician. Surprisingly only12.7% of the patients who left the ED revisited emergency departments within seven days of their departure, and 5% of those were subsequently readmitted. Based on this study, the number of patients who left the emergency department without seeing a doctor was strongly correlated with waiting times. Ding, McCarthy, Li, Kirsch, Jung and Kelen (2006) examined characteristics of patients who left a Maryland ED without being seen from July 2004 through December 2004. The average LWOBS rate for the selected study site was 6.4% with the highest LWOBS rate being July with 8.1%. Findings showed that younger, uninsured patients had a higher risk of leaving without being seen compared to those 55 years and older with commercial insurance (Ding, McCarthy, Li, Kirsch, Jung, & Kelen, 2006).

Although leaving against medical advice (AMA) differs significantly from LWOBS, the importance placed on reducing the numbers of patients who leave and later require hospitalizations are similar. Jerrard and Chasm (2010) studied patient's willingness to return after leaving against medical advice. Notably, they examined how patients fared once they left the emergency department AMA, and the extent of illness that accompanies these patients. A prospective, longitudinal study was conducted of a convenience sample of patients who left AMA over two, 6-month periods, from an ED seeing 32,000 patients annually. A total of 199 patients were identified, with 194 enrolled into the study. Categories of discharge diagnoses included cardiovascular, undifferentiated abdominal pain, respiratory, and cellulitis. Of the 194 patients enrolled 126 patients (64.9%, 95% confidence interval [CI] 57.6–71.5%) stated that their symptoms had improved or resolved since their ED discharge. Of these 126 patients, 109 (86.5%, 95% CI 78.9–91.7%) had an original AMA discharge diagnoses of cardiovascular pathology. Ninety-five patients (75.4%, 95% CI 66.7–82.4%) with improved or abated symptoms did not plan to return. Of those with improved or abated symptoms, 31 patients (24.6%, 95% CI 17.6–33.2%) did return, and with further evaluation, 15 of them were found to have significant clinical findings. Of the 68 patients with continuing symptoms, 36 (52.9%, 95% CI 40.5–64.9%) returned for further evaluation. A total of 127 patients did not return. These patient were interviewed and 25 patients (19.7%, 95% CI 15.9–25.4%) expressed a reluctance to return to the same ED for fear of embarrassment. Seven patients (5.5%, 95% CI 4.8–8.7%) who did not seek

alternative care but were still having symptoms did not return due to job, or family commitments, or because they would follow-up with a personal physician.

The investigators concluded that only a small percentage of patients who left the emergency department against medical advice had "significant pathology." The authors further note that although the overall number of patients who left AMA was small, it is important considering the pathology. Additionally, these patients could suffer greater morbidity or mortality if the patients who left, and were later readmitted had not returned. Mohsin et al (2007) studied 1272 patients who left without being seen by a physician, and in the Jerrad and Chasm study (2010) 199 left against medical advice. In both studies, the emphasis was placed on those who returned and later were admitted. The goal of ED medicine is to reduce the number of patients who leave without being seen, since there is supporting evidence that patients who leave require re-hospitalization.

Asaro, Lewis, & Boxerman (2007) attempted to quantify the impact of input and output factors on ED renege (LWOBS) rate. Patient-level and system-level data from multiple sources in their institution was used to build logistic regression models, with LWOBS as the dependent variable. Findings indicated odds ratio for reneging attributable to the difference between the 80th and 20th percentile values for inpatient bed utilization is 1.05; and the effects of ED input and output factors on LWOBS rate are significant and measurable (Asaro, Lewis, & Boxerman, 2007). Some of the variation in these factors could predict "left without being seen rates". Study findings suggest further refinement in the management of ED and inpatient resources could affect improvement in ED left without being seen rate.

Patients who leave without being seen by a physician pose potential problems to overall patient safety and mortality. The literature is clear that those who leave suffer significant pathology and require hospitalization. Furthermore, the left-without-being-seen population exposes an ED to increased liability, threatens an ED's public relations, and is a potential lost source of revenue for hospitals.

ED Triage and Standard Protocols

"Triage is a dynamic decision-making process that prioritizes a person's need for medical care on arrival at an emergency department" (Gerdtz & Bucknall, 2001, pg.551). The aim of an efficient triage system is to expedite time-critical treatment for patients with life-threatening conditions and ensure that all people requiring emergency assessment are categorized according to their clinical condition (Gerdtz & Bucknall, 2001). With the stress and pressure of ensuring speedy assessment, sorting, and treatment of emergency department patients, the issue of ED overcrowding highlights the need for triage nurses to efficiently and accurately assess patient care needs. ED overcrowding has affected the triage workload primarily because patients that should be in an ED bed must wait to be seen. Gerdtz and Bucknall's (2001) study supported a comprehensive triage system with standard protocols was needed to expedite care, and decrease length of stay in the emergency department.

Cheung, Heenley, and Pound (2002), studied the effects of a complete educational program and advanced triage with limited use of standard protocols. Advanced triage consisted of highly trained triage nurse assessment and the limited use of standard protocols to order laboratory tests and x-rays. "The average length of stay was found to

be 46 minutes less for all patients who were advance triaged, with the greatest time-saving (76 minutes) for patients in the 'Urgent' category" (Cheung et al., 2002, p. 14). Significant savings were realized in the patient's length of stay (LOS) after the emergency physician assessed them, because diagnostic results were readily available (Cheung et al., 2002). In theory, this system could have many advantages. The total time spent by patients in the department should be reduced, the patient would have a feeling of progress, and doctors could see patients with labs and x-rays completed, thus enabling them to see and decide on treatment with a single consultation. In a similar study of nurse-initiated x-ray triage orders, time was saved for patients, and the number of physician consultations per patient was reduced (Lindley-Jones & Finlayson, 2000).

A vast body of knowledge exists in the area of prompt patient management in emergency department patients. The data supports that patients who are treated promptly are less likely to leave the ED prior to examination by a physician, and to be more satisfied with the care they received (Asaro, Lewis, & Boxerman, 2007; Levsky, Young, Masullo, Miller, & Herold, 2008). In a 2008 study by Levsky and associates, the implantation of a treatment protocol in triage was implemented to reduce the LWOBS rates. The triage team was allocated treatment rooms to begin management of urgent patients if a bed in the main ED was not available. A retrospective database study was performed using three separate 6-month periods: two control periods before the intervention, identified as P1, P2, and one period after the intervention which is identified as P3 (Levsky, Young, Masullo, Miller, & Herold, 2008). The primary outcome measures were LWOBS rate, time to evaluation, and total ED time for urgent patients. The time to be seen for EC3

patients improved from P1 to P3 by an average of 12.6 minutes (18.5%, p < 0.0001) and from P2 to P3 by an average of 12.0 minutes (17.6%, p < 0.0001). The EC3 LWOBS rate decreased from 2.0% in P1 and 1.9% in P2 to 0.8% in P3 (p < 0.0001 for both) (Levsky, Young, Masullo, Miller, & Herold, 2008).

Standard Protocol and Pain Management

Emergency department overcrowding has far reaching effects. Overcrowding has been blamed for oligoanalgesia; the under treatment of pain. Pines and Hollander (2008) have hypothesized that emergency overcrowding has contributed to the under treatment of acute pain in the emergency department. A retrospective study of patients who presented to the emergency department in severe pain over a 17-month period was conducted (Pines & Hollander, 2008). Investigators hypothesized patients who waited in an overcrowded ED would experience longer times for pain management and therefore receive poor care as defined by three outcomes: not receiving treatment with pain medication while in the ED, a delay of greater of one hour from triage to first pain medication, and a delay of one hour from room placement to first pain medication. In the above mentioned study, 13,758 patients reported severe pain at ED triage where the median waiting room time was 28 minutes (Pines & Hollander, 2008). A logistic regression model was used to test the association between crowding and outcomes. A total of 6,746 (49%) patients received pain medication while in the ED, of those patients treated with pain medication, 60% were treated with a narcotic analgesic (Pines & Hollander, 2008).

Pines and Hollander (2008) also found the median time from triage to pain medication was 74 minutes. After controlling for factors associated with the ED treatment of pain (race, sex, severity, and older age), the non-treatment of pain was independently associated with waiting room number and occupancy rate. The data also indicated increasing waiting room number and occupancy rate also independently predicted delays in pain medication from triage, and delays in pain medication from room placement. Based on the study's conclusion, crowding is associated with poor quality of care in patients with severe pain defined by the nontreatment of severe pain in the ED (Pines & Hollander, 2008). Based upon these findings fast and prompt treatment of patients who present to the ED in severe pain would increase quality care and patient satisfaction.

Goh, Choo, Lee, and Tham (2007) studied the time difference in analgesia administration in patients with painful limb conditions using an emergency triage nurse initiated pain management protocol versus analgesia administration by emergency doctors after consultation. Patients who arrived to the ED with an isolated limb injury or limb inflammation were selected to participate in the above study. If patient met criteria, a triage nurse initiated the pain management protocol; notably, consultation with the ED physician was not needed to implement the protocol. This protocol utilized intramuscular ketorolac for patients with pain score of 5 or greater. Two hundred seventy-three patients were selected for the study; 73.3% were men and the overall mean age was 40.1 years with standard deviation SD 19.5 (Goh, Choo, Lee, & Tham, 2007). Of the 273 patients, 105(38.5%) received analgesia; 69 received analgesia by triage

nurses, and 36 by physicians (Goh, Choo, Lee, & Tham, 2007). The time interval for analgesia given by triage nurse was 2.5 minutes with standard deviation of 8.9. In contrast, the time interval for physician administered (usual care) was significantly longer at 68.2 minutes with statistical significance at $p<0.0001$ and a standard deviation of 59.5. The investigators concluded that the time interval for pain relief of emergency department patients with painful limb conditions was reduced when the triage nurse initiated pain management (Goh, Choo, Lee, & Tham).

Fosnocht and Swanson (2007) examined a similar protocol initiated at triage; however this study instituted an option to include opioids in their protocol. Unlike Goh, Choo, Lee and Tham (2007), who initiated ketorlac for severe pain, Fosnocht and Swanson had an option of either hydrocodone for moderate pain, and IV morphine sulfate for severe pain. These investigators attempted to demonstrate that initiation of a pain protocol in triage would improve frequency and time delivery of analgesia in musculoskeletal injuries in the ED. A total of 112 patients were enrolled in the triage pain protocol, and 471 patients were enrolled in the control group during times when research associates were available for data collection (Fosnocht & Swanson, 2007). Results showed a time to medication administration of 76 minutes with 95% confidence interval. The average drug administration time was 68-84 minutes before implementation of the pain protocol and 40 minutes after implementation (Fosnocht & Swanson, 2007). Use of a triage pain protocol increased the number of patients with musculoskeletal injury who received pain medication and decreased the time to analgesic medication administration (Fosnocht & Swanson, 2007).

Studies conducted on nurse initiated pain protocols in ED triage indicate the use of pain protocols can decrease the time interval to pain management (Fosnocht & Swanson, 2007; Goh, Choo, Lee, & Tham, 2007). Additional studies support the use of nurse-initiated pain management in ED triage have significantly reduced the time to analgesia administration and increased patient satisfaction (Seguin, 2004).

An exhaustive review of the literature, found limited evidence surrounding triage nurse-initiated orders and its effect on LWOBS rate. In the current state of emergency medicine; overcrowding and patients who leave without being seen pose a safety risk to patients who seek emergency services. The purpose of this study is to bridge this gap and examine whether nurse initiated standard pain protocol reduced the LWOBS rates and add to the current evidence base.

Donabedian's work on quality and measurement of quality care is the selected conceptual framework for this study. Donabedian conceptual model provides a framework to link the structure and process efforts with the desired outcome. Of these desired outcomes, prompt treatment of acute pain in emergency patients and lower LWOBS rates are the most challenging to achieve in an overcrowded ED. Donabedian (1988) opposed the idea of traditional measurement of health care quality, and advanced the idea that quality improvement measures revolve around the concepts of structure, process, and outcome. Structure and process provide the cornerstone for quality patient care and a systematic measure of patient outcomes. A standardized pain assessment and treatment protocol in an overcrowded ED provides the structure and process to effectively examine the effects of quality care. Prompt treatment of pain and reduced

LWOBS rates are an important predictor of clinical outcomes; and studies indicate the more overcrowded the ED, the more likely patients would not receive quality care (Pines & Hollander, 2008).

Donabedian (1988) makes the following point about the quality care: "knowledge about the relationship between structure and process (or between structure and outcomes) proceeds from the organizational sciences." According to the Donabdian's model, structure refers to the physical setting such as facility, human resource refers to the number and qualifications of personnel, whereas organizational structure refers to what methods and processes. This study proposes to examine a structure and process developed to treat acute pain promptly and successfully assess whether structure and process effected left without been seen rates. Based on Donabedian's model, standard pain protocol provide structure and process for ED triage nurses to utilized clinical judgment and knowledge by shifting the responsibility of treatment and initiation of pain management to the ED triage nurse.

In an attempt to address pain management in the ED, a community based medical center located in a large metropolitan area in Southern California implemented a novel nurse initiated pain protocol. The 19 bed ED serves approximately 4,000 ED patients per month. A registered nurse who had been trained in both ESI acuity assignment and triage standard protocol conducted triage and patient assessment. Training began in August and September of 2006. Triage standard protocol was passed through the institutions pharmacy and therapeutics, safe medication practice, and physician committees, with approval in October 2007. Full implementation of the standard protocol began in

November of 2007. Within the standard protocol for pain, once the registered nurse had completed pain assessment and had determined severity of pain, the patient was medicated using the standard protocol as a guideline. Patient with mild pain, categorized as 1 to 3 out of 10, on the numeric pain scale can be given 600mg of ibuprofen. Patients with pain in moderate pain, pain categorized as 4 to 6 out of 10 on the pain scale are given Norco 5/325, 1 to 2 tablets. Patients with severe pain; categorized as 7 to 10 out of 10 can be given 2 to 4 mgs of morphine sulfate intramuscularly. Considering the variability of patient body type and age, the decision regarding dose was dependent on nursing judgment.

Historically, usual care consisted of patients getting either Tylenol or ibuprofen for their pain regardless of pain severity. Narcotics were held in triage until the patient was placed in an available ED bed. After physician examination, orders for narcotic pain medications were given and administered by the registered nurse at the bedside.

CHAPTER 3

METHODOLOGY

The purpose of this study was to examine the association of nurse-initiated triage pain protocol on the LWOBS percentage rate of patients who present with a chief complaint of pain and to identify whether LWOBS can be predicted from the knowledge of an individual's risk factors (age, gender, race/ethnicity), pain severity, pain protocol, and wait time. The Quality Health Outcomes Model informs the examination of the relationship between the predominant patient characteristics (age, gender, race/ethnicity, pain severity), system characteristics (wait time), and outcome (LWOBS). In this chapter, the research design, sample and sample characteristics, procedures for data collection, measurement, as well as data analysis techniques are described. The protection of human subjects is also discussed.

Methods

    Aims of the Study.

        Aim 1.   Characterize patients who present for ED services with a chief complaint of pain.

Aim 2.   Examine the incidence of patients presenting for ED services with

a chief complaint of pain and LWOBS.

Aim 3.   Examine factors that increase the probability of LWOBS in ED

patients experiencing pain.

Design. A descriptive correlational design with retrospective review of pre-

collected data was used in this study to describe the characteristics of patients who

present to the ED in acute pain but leave the department without being seen by an ED

physician. Descriptive designs facilitate examination of information not previously

explored (Kerlinger & Lee, 2000) as was intended with this population.

Procedures

Sample. A purposive sample of patients presenting to the ED of a large urban

community medical center located in Southern California provided data for this study.

Data were abstracted retrospectively from electronic medical record to determine the

relationship of triage standard pain protocol for pain and LWOBS rates. The selected

institution is a 19-bed ED located in a large metropolitan area in Southern California that

serves approximately 4,000 ED patients per month. Included in the study are patient

electronic records of all female and male patients age 18-65 years of age, who presented

to ED triage and were admitted to and discharged from the emergency department for

acute pain, from January 2006 through December 2008. Exclusion criteria included:

patients younger than 18 years of age or older than 65, patients who presented to the ED

via ambulance, patients admitted to the inpatient unit, patient who left before initial

triage, duplicate records, ambulance patients who did not have a name, records with missing data, records containing errors.

Power, Effect and Sample Size. There is no consensus on the approach to compute the power and sample size with logistic regression; although as pointed out by Katz (2006), ten outcomes for each independent variable is appropriate. In logistic regression an estimate of the probability of a certain event occurring is made, rather than detecting the difference or relationship that may be present, such as in linear regression. No assumptions are made about the dependent variable (LWOBS, the relationship is non-linear, and is not normally distributed (Munro, 2005). Some authors use the likelihood ratio test; some use a test of proportions; some suggest various approximations to handle the multivariate case. Some advocate the use of the Wald test since the Z-score is routinely used for statistical significance testing of regression coefficients (Demidenko, 2007). Since this is a descriptive study and not focused on hypothesis testing, the Final Logistic Regression Model, which includes significance defined by $p \leq 0.05$, where p is from the Wald test for Confidence Interval for the Odds Ratio and overall statistical significance is tested by the likelihood ratio test $p \leq 0.1$, is used to demonstrate logistic regression model fit.

Data Collection. Data were derived from electronic medical records for both the patients treated with nurse initiated pain protocol and those treated by an ED physician once they were placed in an ED bed. Data included age, gender, race/ethnicity, ESI acuity, chief complaint category, time the ED, whether treated with triage standard

protocol, usual care, and whether they left the ED without being seen by an ED physician will be abstracted.

Measurement

Emergency Severity Index. ESI is a five-tiered triage system used to sort and prioritize patients; it also determines patients' risk for deteriorating if they wait to be seen (Gilboy, Tanabe, Travers, Rosenau, & Eitel, 2005). ESI level, is determined by the triage nurse. According to the scale, an ESI level 1 is a patient who requires life-saving intervention. ESI level 2 patient has a condition that could rapidly deteriorate, has severe pain, or exhibits new-onset confusion. ESI level-2 patients are hemodynamically stable, but should not wait to be placed in the first available bed.

An ESI level 3 patients does not have a condition that meets the level 2 criteria and is able to safely wait for care. The level 3 patient needs more than one resource to determine where the patient will be routed once diagnosis has been established. Such resources might include laboratory tests, some radiological exams, and anticipated treatments. Level 4 and 5 patients require one or no resources, these patient are seen as not requiring an ED bed.

Chief Complaint Category. All patients presenting to the ED are asked about their presenting complaint and then this complaint documented entered into electronic medical record as a "chief complaint." Chief complaints are documented as "free-text" chief complaints and then are categorized into system groupings. For example, a patient with a chief complaint of chest pain will have their chief complaint documented as "chest pain" and then further categorized under the "Cardiac" system chief complaint category.

ED nurses at the selected institution have been trained in the assessment of patient chief complaint and appropriately categorizing chief complaints.

Pain Assessment. All patients who present to the selected ED are assessed for pain at initial triage using the Numeric Rating Scale (NRS). This information is inputted into a computerized order entry and charting system call EmStat. Data collected will include electronic patient records of patients who presented to the ED with a chief complaint of pain, and were later discharged with a diagnosis of pain. Data collected will include pain rating and time pain was assessed. Pain will be categorized as either mild, moderate, or severe. A score of 1-3 on the NRS will be categorized as mild, a score of 4-6 will be categorized as moderate, and a score of 7-10 will be categorized as severe. Patients excluded are those who were later admitted to the patient the in-patient unit.

Triage Standard Protocol for Pain. At the selected ED, triage nurse can choose to administer analgesic such as ibuprofen, hydrocodone, or morphine without a physician's order based on pain severity and clinical judgment using triage standard pain protocol. Using a computerized ordering system, medications ordered for pain are inputted into the patient's electronic medical record. Patient with mild pain, categorized as 1 to 3 out of 10, on the numeric pain scale can be given 600mg of ibuprofen. Patients with pain in moderate pain, pain categorized as 4 to 6 out of 10 on the pain scale are given Norco 5/325, 1 to 2 tablets. Patients with severe pain; categorized as 7 to 10 out of 10 can be given 2 to 4 mgs of morphine sulfate intramuscularly. If medications are ordered by an RN using triage standard protocol, these orders are labeled as "SP" (standard protocol/standardized procedures) in the medical records. Data collected on

pain treatment will be those patients who have an analgesic ordered either by a trained triage nurse or by a physician. Although these patients may have had an analgesic ordered by a physician, this does not mean a physician saw them prior to entering the order for pain management. These cases coded, as physician ordered analgesics are still nurse-driven, however the nurses requested an analgesic from an ED physician and entered the order as a verbal order.

Usual Care. Data collected from the electronic medical records will include whether patients treated for pain were treated using triage standard pain protocol or physician medication order. Additionally time that the order was entered into the electronic medical record and time the medication was administered was collected.

Disposition. Patient disposition measured whether the patient stayed to be seen by a physician or if the patient left prior to being seen a physician after being seen and treated in triage for pain. Patient data with a disposition of "Left Prior to Treatment" and "Left prior to being seen" was also included. Patients who left the ED without being seen in the ED have a documented disposition of either "Left Prior to Treatment" or "Left Prior to being Seen." The dispositions are documented by the ED triage nurse, and are determined to be the case when patients leave before treatment by the ED triage nurse or being evaluated by an ED physician. Patients who fit the above categories will have demographic data entered into the electronic patient record (age, gender, race/ethnicity) along with past medical history, vital signs, and treatment protocols ordered and administered (length of stay).

Data Analysis

Descriptive and inferential statistics were used in the analyses. Descriptive statistics included the mean, median, mode and standard deviations for numerical variables to characterize the LWOBS patient sample for aim number one. Chi-Square analyses were computed for observed frequencies for categorical predictor variables: gender, ethnicity, and admit time. Pearson's correlation was calculated to examine relationships between the continuous predictor variables length of stay and age. Logistic regression analysis was used to identify factors associated with the probability of LWOBS.

Logistic regression is a multivariate statistical analysis that can be used to predict membership in one dichotomous variable from a set of independent variables. Since the dependent variable is categorical and the explanatory variables are either categorical and or continuous, the logistic regression model can be used to predict membership in one of the outcome categories. The tolerance statistic in the SPSS software can examine multicollinearity among the independent variables to insure that they do not measure the same thing. Tolerance statistics less than 0.10 would suggest a collinearity problem within the identified independent variables (Mertler & Vannatta, p. 169, 2005) and would require re-examination of predictor variables for inclusion in the study.

Limitations

There are the following limiting factors that must be considered when reviewing the results of this study. First, data collected for comparison is prior to implementation of standard pain protocol and extensive triage training. We will be unable to examine pain

management prior to ED triage pain protocols. If patients presented in severe pain orders were obtained from ED physician for implementation in ED triage, however this data was not captured in the electronic medical record. The type and dosage of analgesia were not studied and so we are unable to determine if the type of treatment received in triage was associated with disposition. Secondly, when examining characteristics of patients who leave the ED prior to being seen by a physician, patients who are frequent utilizers of other EDs will not be captured since this information is not shared. Lastly results may not be generalizable to EDs of a different size, bed capacity, and patient population.

Human Subjects Protection

To ensure protection of all subjects' freedom from intrinsic risk or injury, all human subject protection considerations were used in this study. Since this is a retrospective medical record extraction with all patient identification removed, no informed consent was required. During the process of collecting the data all information was stored in a code protected data base and accessible only to the principle investigator. All patient identifying data was removed and substituted by codes. All methods of data collection and study plans were reviewed and approved by the Institution Review Boards at the University of San Diego and Sharp Healthcare: Chula Vista.

CHAPTER 4

RESULTS

The purpose of this study was to examine the association of nurse-initiated triage Pain Protocol in Triage on the LWOBS percentage rate of patients who present with a chief complaint of pain and to identify whether patient who stayed to be examined by a physician can be predicted from the knowledge of an individual's risk factors (age, gender, race/ethnicity), pain severity, pain protocol, and wait time. The Quality Health Outcomes Model informs the examination of the relationship between the predominant patient characteristics (age, gender, race/ethnicity, pain severity), system characteristics (wait time), and outcome (LWOBS). Study findings will be presented in this chapter. First, a description of the sample is provided followed by results related to the research questions.

Participant Profile

The sample (N = 1338) was approximately two-thirds female (63%, n = 846). Age ranged from18 to 65 (M = 37, md + 35, SD = 12). The sample was diverse with slightly less than half were Hispanic (43.3%, n = 174), White (13.3%, n = 567), African American (6.1%, n = 80), Asian (8.5%, n = 111), Pacific Islander 3.1%, n = 41), and

other (25.7%, n = 336) and is representative of the city's racial background (US Census,

2010). Patients presented to the ED with the following specific pain related chief

complaint: Abdominal (24%), Cardiac (16%), Non-Trauma Musculoskeletal (34%), and

Traumatic (10.3%). Patients were staged in the following ESI levels: ESI Level 2(10.3

%), ESI Level 3 (70.3 %), ESI level 4 (18.7 %) and (.6%) 5. Approximately 70% (n =

941) patients met level 3 criteria.

Table 1

Patient Characteristics

Characteristic	% (N)	LWOBS	Seen	$F (df)$	χ^2	Sig. (p)
Gender					.066 (1)	.797
Male	36.5% (489)	36.5% (406)	37.4% (83)			
Female	63.2% (846)	63.5% (707)	62.6% (139)			
Missing	.2%					
Mean Age	36.65	36.3	38.2	1.051 (47,1289)		.381
Race/Ethnicity					20.086 (6)	.003
White	13.3% (174)	11.7% (127)	21.4% (47)			
Hispanic	43.3% (567)	43.2% (471)	43.6% (96)			
Black	6.1% (80)	6.1% (67)	5.9% (13)			
Asian	8.5% (111)	8.6% (94)	7.7% (17)			
PI	3.1% (41)	3.0% (33)	3.6% (8)			
Other	25.7% (337)	27.3% (298)	17.7% (39)			
Missing	2.1%					
ESI Acuity					8.470 (3)	.037
Level 2	10.3% (138)	9.3% (104)	15.2 % (34)			
Level 3	70.3% (941)	71% (791)	67.3 % (150)			
Level 4	18.7% (250)	18.9% (211)	17.5 % (39)			
Level 5	.6% (8)	.7% (8)	.0 % (0)			
Missing	.1%					
Mode of Arrival					1.592 (1)	
Walk In	99.5% (1331)	99.9% (1109)	99.6% (222)			
Medic	.1% (2)	.1% (1)	.4% (1)			
Missing	.4%					

Note: N = 1338, p < .05

Characteristic	% (N)	LWOBS	Seen	F (df)	χ²	Sig. (p)
Pain Score (NAS)					.697 (10)	.697
0	.2% (2)	.1% (1)	.1% (1)			
1-3	3.9% (24)	2.2% (20)	1.8% (4)			
4-6	61.9% (707)	62.5% (578)	61.1% (129)			
7-10	35.7% (408)	35.6% (306)	36.4% (71)			
Missing/Not Rated	14.7% (196)					
LOS				1.951(28 3, 1053)		.000
in minutes	163	144	256			
in hours	2.7	2.4	4.3			
Received Pain Tx in Triage?					384.234 (2)	.000
Yes	81.8%(1093)	66.1% (883)	94.3 % (210)			
No	18.2% (243)	17.2% (230)	5.8% (13)			
Missing	.1%					
Order for Pain Tx Entered By Provider					24.477 (2)	.000
RN	59.8% (800)	67.2% (749)	23.0% (51)			
MD/PA (Medication Ordered by Not Seen by Provider)	21.9% (293)	12.0% (134)	71.6% (159)			
Not Treated	18.2% (243)	20.7% (231)	5.4% (12)			
Missing	.1%					
Chief Complaint						
Gastrointestinal	23.6% (315)					
Cardiovascular	15.9% (212)					
MSNonT	13.7% (183)					
OrthoTrauma/ Laceration	10.3% (138)					
Neurological	8.5% (113)					
Obstetrical	4.5% (60)					
Fever	4.0% (54)					
UroGent/Gyne	4.0% (54)					
ENT	3.7% (50)					
Dermatological	2.8% (37)					
Renal	2.4% (32)					
Dental	1.3% (18)					

Characteristic	% (N)	LWOBS	Seen	F (df)	χ^2	Sig. (p)
Chief Complaint						
Generalized Pain	1.3% (18)					
Eye	1.1% (15)					
Substance Abuse	1.0% (13)					
Respiratory	.9% (12)					
HemOnc	.4% (5)					
Multiple Complaints	.3% (4)					
Immunology	.2% (3)					
Endocrine	.1% (1)					
Missing	.1%					

Examine the Incidence of Patients Presenting for ED Services with a Chief Complaint of Pain and LWOBS. A Pearson chi square test was conducted to examine the relationship between the study categorical variables and whether a patient stayed or left the ED prior to being seen by a physician. Analysis showed there was a relationship between race/ethnicity, treatment in triage, and treatment order entered by provider and disposition. Race/ethnicity was statistically significant (χ^2 = 20.09, df = 6, p = .003), as was treatment in triage (χ^2 = 27.48, df = 1, p < .000), and treatment order entry by provider (χ^2 = 384.234, df = 2, p < .000). There was a statistically significant difference between for the groups as determined by one-way ANOVA for the variable LOS [F (283, 1053) = 1.951, p = .000]. There was not a statistically significant difference between groups as determined by one-way ANOVA for the variable age [F (47, 1289) = 1.051, p = .381].

Examine Probability of LWOBS in ED Patients Experiencing Pain. A logistic

regression analysis was conducted to examine which predictor variables (age, ESI Level,

Race/Ethnicity, LOS, Treatment in Triage, Pain Score, and Order for Pain Treatment by

Provider) increased the odds of whether a patient left or stayed in the ED to be seen by a

physician (MD, APN, PA). A test of the full model against a constant only model was

statistically significant, indicating the predictors, as a set, reliably distinguished between

those who stayed in the ED to be seen by a physician (chi square = 369.12, p < .000 with

df = 14). Hosmer-Lemeshow test indicated the model was a good fit to the data χ^2 = 7.89

(8), .447.

Nagelkerke's R^2 of .457 indicated a moderate relationship between prediction and

grouping. Prediction success overall was 86.2%% (93.8% for LWOBS and 52.7%% for

Seen). The Wald criterion demonstrated LOS, Treatment in Triage, and Order for

Treatment made a significant contribution to the probability of a patient staying to be

seen by a provider (p < .05). Treatment in triage was significantly associated with

staying to be seen by a provider (B = -5.075, Wald 129.384, p < .001, OR = .006, 95% CI

for OR = .003. As treatment for triage increases, the odds of staying to be seen by a

physician decrease by .006. Treatment order entry by provider is also significantly

associated with a patient staying to be seen by a physician, B = 2.984, Wald = 195.422, p

< .001, OR = 19.76, 95% CI 13.00. Race also made a significant contribution to

probability of staying to be seen (p = .037). Pain orders entry by provider had a 20

times greater likelihood of staying in the ED to be seen when controlling for individual

differences in those who entered the order for pain intervention. EXP (B) value indicates

that with one unit increase in LOS the odds ratio for staying in the ED to be seen by a

physician or physician designee is increased by 1.

Table 2

Logistic Regression Predicting Disposition From Age, ESI, Race/Ethnicity, LOS, Treatment in Triage, Pain Score, and Order for Pain Treatment by Provider

Predictor	B	Wald χ^2	df	p	Odds Ratio	95% CI	
						Lower	Upper
Race/Ethnicity	.672	4.332	1	.037	1.959	1.040	3.690
LOS	.006	51.886	1	.000	1.006	1.004	1.007
Treatment in Triage	-5.075	129.384	1	.000	.006	.003	.015
Order for Treatment	2.984	195.422	1	.000	19.761	13.005	30.024
Age	-.003	.193	1	.660	.997	.981	1.012
ESI	20.260	.000	1	.999	6.291E8	.000	.
Pain Score	.056	.090	1	.764	1.057	.735	1.522

Nagelkerke R^2 = .457 (Hosmer and Lemeshow Test), .41

Model (likelihood ratio) Chi-square = 369.12 (14), p = .000

Percent correctly classified = 86.2%

CHAPTER 5

DISCUSSION OF FINDINGS

Standard practice is to assess and treat pain early in the ED visit, but pain is still

undertreated. Overcrowding leads to increased wait times, which in turn leads to the

under treatment of pain and patients leaving without being seen by a physician. As a

result the focus on treating pain prompting and reducing the number of LWOBS are a

high priority for emergency departments. Although many patients who leave without

being seen have non-urgent chief complaints, research has shown that some who leave

have illnesses that require hospitalization. A disproportionate number of patients wait for

care which increases the risk for patients leaving prior to being seen by a physician.

Numerous factors can contribute to the decision to leave the ED prior to being seen, for

instance "situation[s] in which emergency need outstrips available resources, in other

words when there are more patients than [ED] beds," patients are most likely to leave the

ED prior to being seen (Asplin et al., 2003, p. 174). Untreated pain contributes to this

patient risk. The findings from this study support previous research by Todd (2004), we

found most patients who present to the ED in pain have scored their pain as either

moderate to severe.

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Specific patient characteristics that increased the odds of patients staying to see a

provider were identified in the study presented here. Similar to research conducted by

Baker and colleagues (1991) findings from this study revealed age was not a factor in

patients leaving or staying to be seen. In contrast to Baker and colleagues (1991), who

found gender was a factor, our findings did not support this relationship. However a

significant relationship between disposition and race/ethnicity and LOS and disposition

was found. Although ESI acuity was not found to be associated with staying or leaving

the ED to be seen by a physician, patients who were classified as a Level 3 patient made

up a larger portion of those patients who left the ED without being seen which supports

the work of Ding et al (2006).

The most important patient characteristics associated with disposition were

treatment in triage and treatment order entered by provider. We see a higher probability

of being seen, and therefore we can conclude treating pain in triage significantly

influenced whether a patient left or stayed in the ED to be seen by physician. These

findings reflect the 94.2% who stayed to be seen by a provider were treated for pain in

triage. Treatment by provider order entry was highly significant. Results indicate that

there is an association between the treatment order entered by provider and if they stayed

to be seen by a provider. The findings reflected 71.6% of those who stayed to be seen

were treated with an order placed by the physician. In other words the nurses consulted

the physician and obtained orders for pain treatment rather than use the pain protocol. In

this group, the physician did not see the patient prior to being consulted and were not

examined by a physician prior to treatment order entry. Although only 23% of RN order

entry using Triage Standard Protocol for Pain resulted in patients staying, this number

taken together with the Physician order entry, might suggest the type and dose of

analgesia may had played a factor in patient disposition. While this study did not find

patients who stayed were treated with a particular type or dose of analgesic, it did support

treatment in triage contributed to whether a patient stayed or left the ED prior to being

seen by a physician.

However it could be argued those who were treated for pain with RN protocol in

triage were highly satisfied and left the ED after their pain was relieved. Although

LWOBS means leaving the ED prior to the medical screening exam, those patients who

have visited an emergency department have encountered the first and most important

provider, the highly trained ED Triage Nurse. Therefore, a patient staying to see a

physician for their medical screening exam is important. Results from this research can

support the use of front end treatment by nurses to expedite care and ensure a speedy and

safe discharge from the ED. This would reduce overcrowding, wait times and cost of care.

Implication for Future Research

Although results from this study are promising and provided knowledge on the

use of pain protocol in triage, limited information was gathered on the type of analgesic

used to treat patients. More broadly, research is needed to determine the type of

medication and thus give insight into whether the type of analgesic had an effect on a

patient's decision to leave or stay in the ED or possibly length of stay. Also, further

research is needed to study nursing perception about the use and application of the pain

protocol should also be studied; to help gain information on whether nursing perception

or attitudes influence how a nurse uses the pain protocol in triage. Additional research would add information about the need for front end treatment by RNs to help expedite care and reduce length of stay in the ED.

Practice Implication

These findings have important implications for nursing practice. Because patients who were treated in triage was associated with patients staying in the ED, pain management in triage to promptly reduce pain and the number of patients who leave the ED prior to being seen by a physician is needed. This information can be used to develop strategy interventions aimed at treating pain aggressively and early in the ED visit so that patients stay to be seen by a physician. An opportunity exists for Emergency Departments to support the use of triage pain protocols by nurses to improve pain management and reduce the percentage of left without being seen. There is, therefore, a definite need for educating ED nurses on the application of triage pain protocol, since effective pain management influences whether patients stay or leave the ED prior to being seen by a physician. Notably, being seen and treated by the physician can decrease the number of return visits through evaluation and referral for underlying etiology of pain. Additional practice implications can include strategies aimed at effective pain management in triage and its impact on length of stay.

REFERENCES

Asaro, P. V., Lewis, L. M., & Boxerman, S. B. (2007) Emergency department

   overcrowding: Analysis of the factors of renege rate. *Academic Emergency*

   Medicine, 14, 157-162.

Asplin, B. A., Magid, D. J., Rhodes, K. V., Solberg, L. I., Lurie, N., & Camargo, C. A.

   (2003). A conceptual model for emergency department overcrowding. *Annals of*

   Emergency Medicine, 42, 173-180.

Asplin, B. A. (2006). Measuring crowding: Time for a paradigm shift. Academic

   Emergency *Medicine Journal, 13,* 459-461.

Baker, D. W., Stevens, C. D., & Brook, R. H. (1991). Patients who leave a public hospital

   emergency department without being seen by a physician: Causes and

   consequences. *Journal of American Medical Association, 266,* 1085-1090.

Cheung, W.H., Heenley, L., & Pound, J. L. (2002). An advance triage system. *Accident*

   and Emergency Nursing, 10, 10-16.

Dershewitz, R. A. & Paichel, W. (1986). Patients who leave a pediatric emergency

   department without treatment. *Annals of Emergency Medicine, 15,* 717-720.

Ding, R., McCarthy, M. L., Li, G., Kirsch, T. D., Jung, J. J. & Kelen, G. D. (2006).

   Patients who leave without being seen: Their characteristics. *Annals of*

   Emergency Medicine, 48, 686-693.

Donabedian, A. (1988). The quality of care: How can it be assessed? *Journal of the*

   American Medicine Association, 260, 1743-1748.

Fosnocht, D. E., & Swanson, E. R. (2006). Use of triage pain protocol in the ED.

   American Journal of Emergency Medicine, 25, 791-793.

Gibson, G., Maiman, L. A., & Chase, A. M. (1978). Walk-out patients in the hospital

    emergency department. Journal of American College of Emergency Physicians.

    7(2):47-50.

Gilboy, N., Tanabe, P., Travers, D. A., Rosenau, A. M., & Eitel, D. R. (2005).

    Emergency Severity Index, Version 4: Implementation handbook. AHRQ

    Publication No. 05-0046-2, May 2005. Agency for Healthcare Research and

    Quality.

Gerdtz, M., & Bucknall, T. (2001). Triage nurses' clinical decision making: An

    observational study of urgency assessment. *Journal of Advanced Nursing, 35,*

    550-561.

Goh, H. K., Choo, S.E., Lee, I., & Tham, K. Y. (2007). Emergency department triage

    nurse initiated pain management. *Hong Kong Journal of Emergency Medicine,*

    14, 16-21.

Jerrard, D. A. & Chasm, R. M. (2010). Patients leaving against medical advice (AMA)

    from the emergency department-disease prevalence and willingness to return. *The*

    Journal of Emergency Medicine,

Levsky, M. E., Young, S. E., Masullo, L. N., Miller, M. A., & Herold, T. J. S. (2008).

    The effects of an accelerated triage and treatment protocol on left without being

    seen rates and wait times of urgent patients at a military emergency department.

    Military Medicine, 173. 999-1003.

Liao, H. C., Liaw, S. J., Hu, P. M., Lee, K. T., Chen, C. M., & Wang, F. L. (2002).

    Emergency department patients who leave without being seen by a doctor: The

    experience of a medical center in northern Taiwan. *Chang Gung Medical Journal,*

    25, 267-273.

Lindley-Jones, M., & Finlayson, B. J. (2000). Triage nurse requested X-rays: Are they

    worth while? *Journal of Accident & Emergency Medicine, 17*,103-107.

Mohsin, M., Forero, R., Leraci, S., Bauman, A. E., Young, L., & Santiano, N. (2007). A

    population follow-up study of patients who left an emergency department without

    being seen by a medical officer. *Emergency Medicine Journal, 24*, 175-179.

Pines, J., M. & Hallander, J., E. (2008). Emergency department crowding is associated

    with poor care for patients with severe pain. *Annals of Emergency Medicine, 51;*

    (1), 1-5.

Ramakrishnan, M., Sier, D., & Taylor, P. G. (2005). A two-time-scale model for hospital

    patient flow. *IMA Journal of Management Mathematics, 16,* 197-215.

Richardson, D (2006). Increased in patient mortality at 10 day associated with emergency

    overcrowding. *Medical Journal of Australia, 184,* 213-216.

Seguin, D. (2004). A nurse-initiated pain management advanced protocol for ED patients

    with an extremity injury at a Level I trauma center. *Journal of Emergency*

    Nursing, 30, 330-335.

Todd, K. H. (2004). Pain management in the emergency department. *American College*

    of Emergency Physicians. Chicago.

Trzeciack, S., & Rivers, E. P. (2003). Emergency department overcrowding in the United

    States: An emerging threat to patient safety and public health. *Emergency*

    Medicine Journal, 20, 405.