Southern California CSU DNP Consortium

California State University, Fullerton
California State University, Long Beach
California State University, Los Angeles

UTILIZATION OF ACUTE CARE NURSE PRACTITIONERS IN THE EMERGENCY DEPARTMENT

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By

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ABSTRACT

Even with the passing of new legislation relative to health care, it seems likely that emergency departments (ED) will continue to see large, increasing patient volumes. With the Patient Protection and Affordable Act (PPACA), there is anticipated influx of patients to the healthcare arena and consequently the ED. Improving triage, treatment protocols, and systems currently in place could reduce the strain of waiting in EDs and increase patient satisfaction. Like many modern EDs in the United States, the department at a large Catholic based southern California hospital (henceforth, “The Hospital”) has experienced significant increases in patient numbers over the past 10 years; it is anticipated this upward trend in patient volume will continue into the future. After reviewing the literature and critically observing the processes in The Hospital ED and several other EDs the outcomes of this project are a recommended new standard order set for the ED and a set of recommendations for personnel and process changes that will improve the throughput of the ED. The utilization of acute care nurse practitioners (ACNP) as part of an ED triage team is one such change. Other recommendations are using a pivot nurse, doing abbreviated triage, and having medical screening evaluations done and initial orders written in the triage area when all ED beds are full. Improving multiple aspects of the ED’s functioning, specifically, the front-end throughput, patient satisfaction, and federal metric scores.
TABLE OF CONTENTS

ABSTRACT ............................................................................................................................ iii

LIST OF TABLES ................................................................................................................ vi

LIST OF FIGURES ............................................................................................................. vii

ACKNOWLEDGMENTS ...................................................................................................... viii

BACKGROUND ............................................................................................................... 1

   Issues of the Emergency Department ..................................................................... 2
   Triage ..................................................................................................................... 4
   Wait Times ............................................................................................................ 4
   Left Without Being Seen .................................................................................... 6
Problem Statement ........................................................................................................... 7
Project Purpose and Objective ....................................................................................... 7

REVIEW OF LITERATURE ............................................................................................... 10

   Terms ....................................................................................................................... 10
   Proposed Solutions in the Literature .................................................................... 10
   Time is Satisfaction ............................................................................................ 12
   Emergency Severity Index .................................................................................... 13
   Innovative Triage ................................................................................................ 13
   Pivot Nurse ........................................................................................................... 14
   Abbreviated Triage .............................................................................................. 14
   Team Triage ........................................................................................................... 15
   Bedside Triage: Pull ’til Full ............................................................................... 15
   Medical Screening Exams in the Triage Area ...................................................... 16
   Nurse Practitioners ............................................................................................... 16
   Acute Care Nurse Practitioners .......................................................................... 17
   Standardized Procedure and Standardized Order Sets ....................................... 20
   Theory of Constraints ........................................................................................... 21

PROJECT DESIGN ............................................................................................................ 23

   Setting and Resources .......................................................................................... 23
   Data Source ............................................................................................................ 24

   iv
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Hospital Emergency Department Scorecard 2013</td>
<td>8</td>
</tr>
<tr>
<td>2. Common ED Terms and Definitions</td>
<td>11</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Hospital ED total patients registered 2013.</td>
<td>26</td>
</tr>
<tr>
<td>2. The Hospital ED arrival to provider 2013.</td>
<td>27</td>
</tr>
<tr>
<td>3. The Hospital ED median length of stay 2013.</td>
<td>28</td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

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BACKGROUND

Emergency departments (ED) are at the forefront of the changes occurring in healthcare. Emergency departments are inundated with patient volume increases as approximately 20% of the United States population reported utilizing the department in 2012 (National Center for Health Statistics [NCHS], 2013). Alongside genuinely caring for the ill, stringent metrics tied to Medicare reimbursement have now been established by Centers for Medicare and Medicaid Services (CMS) to ensure quality performance of EDs. Current metrics or process measures are related to patient satisfaction and care quality; these are available to the public on CMS’s Compare website (Agency for HealthCare Research and Quality [AHRQ], 2011). For 2013 and 2014, the CMS mandated emergency department measures are related to timely provision of care including door to diagnostic evaluation by a qualified medical professional (AHRQ, 2011).

Emergency department visits can be divided into distinct care based segments. The process of moving from one segment to the next is referred to as throughput (Zun, 2009). Throughput is comprised of front-end processing (triage and registration), door to bed, door to provider, provider to discharge; the entire process measure is referred to as door to discharge (Zun, 2009). Efficient throughput is dependent on effectively transitioning the patient from one process and/or location to the next. A delay in any segment increases total length of stay. Increased time in the department is responsible for patient dissatisfaction and has direct and indirect financial implications (Welch, 2010).
This project’s purpose is to conduct an in-depth analysis of emergency department throughput in one southern California hospital (The Hospital) to identify barriers to timely care. Processes are evaluated to determine obstacles to efficient transitioning from triage to provision of care and ultimately discharge from the department.

**Issues of the Emergency Department**

Emergency departments are complex in design, providing episodic care that is often implemented emergently to a population with limited other resources. There is a potential for encountering multiple barriers and issues across the continuum of health care delivery in this setting. Overcrowding is one such issue and is responsible for delaying care (Cooke, Watt, Wertzler, & Quan, 2006; Welch, 2010).

A systematic review by Hoot and Aronsky (2008) yielded commonly studied causes of ED crowding. These included non-urgent visits, “frequent-flyer” patients, influenza season, inadequate staffing, inpatient boarding, and bed shortages. The factors responsible for crowding have subsequently produced studies regarding patient mortality, delays in treatment, ambulance diversion, patient elopement, and financial effects (Hoot & Aronsky, 2008). This study also reported commonly cited solutions of department crowding such as additional personnel, destination control, and various front-end triage models.

Seasonal variations occur in terms of ED admissions through the course of the year (McLaughlin, Brown, Hillman, Brice, & Heyman, 2005). Illnesses affected by cold weather, for example, asthma or upper-respiratory-tract infections, cause patients to visit the ED more often during the winter months. In a study of acute myocardial infarction
admission rates over the course of the year, January was found to be the peak admission month for male patients, and December the peak admission month for female patients (Manfredini et al., 2009).

Another finding in the literature is that more patients present to the ED on Mondays than any other day of the week (Manfredini et al., 2009). This indicates that patients take into account factors such as work schedules and ED wait times. Furthermore, the ED has predictable peak hours of the day (McCarthy et al., 2008; Siler Fisher et al., 2005) starting around 10 a.m.

Moreover, the financial issues concerning the ED care indirectly affected by overcrowding are immense. One study revealed that a hospital lost $3,881,506 in net revenue largely as a result of ambulance diversions and patient elopements from their ED waiting room during a 12-month period because of ED saturation (Falvo, Grove, Stachura, & Zirkin, 2007). Potential revenue loss to the hospital is a tremendous business issue, as evidenced with the Centers for Disease Control and Prevention (CDC; 2013) reporting an average ED patient charge increase of $969 from $546 in the last decade. Furthermore, the proportion of patients seen in the ED who were discharged and subsequently readmitted to the hospital rose from 2% to 4.9% in 2009 (Pines, Mullins, Cooper, Feng, & Roth, 2013) indicating an ever-growing cycle of failed outpatient treatment. The development of recent CMS (2013) regulations concerning readmission penalties can cause hospitals with poor discharge management to lose significant revenue.
Triage

Emergency departments have traditionally applied a logistic triaging. A registered nurse (RN) attends a traditional formal triage area and obtains the patient’s chief complaint, symptoms, past medical and surgical history, vital signs, medications, and allergies. Subsequently, the triage nurse categorizes the patient’s condition and assigns an acuity using a severity scale such as the Emergency Severity Index (ESI; Wuerz, Milne, Eitel, Travers, & Gilboy, 2000). Once this is established, then the patient is either moved back to the waiting room or bedded in the department relative to his/her severity and/or bed availability.

Niska, Bhuiya, and Xu (2010) reported that the CDC categorizes arrival acuity based on how urgently the patients need to be seen by the healthcare provider. In 2009-2010, the national triage patient classification demographics were 12% “emergent” and needed to be seen within 15 minutes, 46% “urgent” needed to be seen in 15-60 minutes, 35% “semi-urgent” needed to be seen in 1-2 hours, and lastly 7% were “non-urgent” which needed to be seen anywhere from 2 to 24 hours (NCHS, 2013).

Wait Times

The wait to be seen for emergency care is one of the most important indicators of patient satisfaction. Prolonged wait times are associated with increased numbers of patients leaving without being seen (Hoot & Aronsky, 2008). The NCHS (2013) reported overall ED times to see a provider has increased from 45 minutes to 55 minutes over the last 2 decades. Additionally, a 14.9% increase in waiting time and length of stay (LOS) minutes may be indirectly added to the wait time for a patient who has already been
waiting to see a provider if a more acute patient presents because resources and attention would be diverted to the critical case (Xu et al., 2013).

Peak times in the ED are predictable. The study of ED patient arrivals from 15 community and academic hospitals between January 2003 and December 2003 by Siler Fisher et al. (2005) showed the majority of patient visits (66.5%) increase steadily between the hours of 10:00 a.m. and 10:00 p.m., with an hourly range of 5.2% to 5.9%. Additionally, the lowest percentage of patient arrival per hour occurs between 4:00 am and 5:00 am (1.5%).

Only a minority of hospitals consistently achieves recommended wait times for all ED patients. Hing and Bhuiya (2012) reported that longer wait times were associated with EDs in urban areas than those in non-urban areas, 62.4 and 40.0 minutes respectively. By simply evaluating the average minutes, it is evident that the majority of the EDs are clearly already missing the federal metrics. This is consistent with a study reporting only 31% of EDs achieved the target time for more than 90% of their patients (Horwitz, Green, & Bradley, 2010). Subsequently, only 14% of EDs in this study achieved the door-to-provider target for 90% or more of their patients within the hour (Horwitz et al., 2010).

In an attempt to market to the public, some hospitals have implemented publicly posting their ED wait times. However, research by Jouriles et al. (2013) revealed some EDs have actual wait times that are significantly different than those posted. The research then reported that publicly posted ED wait times show better accuracy in EDs that see 2,000 or fewer patients per month and less accuracy for an ED that sees 5,000 patients per month. Additionally the patients’ length of stay expectations were
significantly shorter than the actual length of stay for all patient groups (Cooke et al., 2006). Furthermore, this study revealed more than half of the patients surveyed felt that they should wait less than an hour in the ED before a provider evaluates them.

Left Without Being Seen

One of the federally reported ED metrics is its left without being seen (LWBS) numbers. Studies found the most common reason for a patient leaving without being treated in the ED was the length of wait before being bedded (Johnson, Myers, Wineholt, Pollack, & Kusmiesz, 2009; Rowe et al., 2006). Rowe et al. (2006) studied a convenience sample of LWBS cases that were chosen during seven 7-day periods from May to August 2002 and four similar periods from May to July 2003. The investigation found 300 (60%) of LWBS patients sought medical attention again within one week of their first attempt, 14 patients (5%) were admitted to the hospital, and one required urgent surgery.

With the passing of the PPACA, influx of patients to the healthcare arena and consequently the ED is anticipated. From 1999 to 2007, adults with Medicaid accounted for most of the increase in the ED visits as well as the percentage of total ED visits in which the patient has LWBS (Tang, Stein, Hsia, Maselli, & Gonzalez, 2010). Moreover, the increased utilization of the ED by Medicaid patients is also disproportionate compared with patients with private insurance (Cheung, Wilfer, Lowe, & Ginde, 2012). This may be related to the belief that publicly insured patients are less likely to have an ongoing source of care outside of the ED.
**Problem Statement**

The Hospital ED has seen a tremendous increase in the numbers of patients utilizing its services in the last decade, and this trend is predicted to continue. Patient safety, patient satisfaction, and adherence to stringent federal metrics will be affected if the ED’s throughput is not improved. An appropriate process map guideline to properly resolve this problem needs to be identified.

**Project Purpose and Objective**

During the year 2013, The Hospital had an average arrival-to-provider time of 69 minutes, utilizing the Pivot Nurse-ESI triage system (see Table 1). In January 2013, The Hospital ED’s busiest month of that year, it took 95 minutes to be seen by a provider, length-of-stay median was 271 minutes, and 316 patients left without being seen. Reflectively, the patient satisfaction score was a mere 67.5% and the elopement (patients who left before being discharged) was at a yearly high of 684 (5.6%) patients. This data identified significant issues in front-end throughput.

The objective of this project is to improve the metrics by utilizing a new ACNP role and associated front-end throughput process map guideline (Appendix A). The purpose of this project is to produce a front-end throughput protocol and Standardized Procedure Order Set in Triage (Appendix B) for the ACNP role in the ED of The Hospital. This standardized procedure order set and front-end throughput process map guideline is informed by the theory of constraints, a literature review, and the competencies of the ACNP. Although the project plan focuses on improving front-end entrance in the ED, full implementation will affect overall patient throughput and by extension, improve patient satisfaction.
<table>
<thead>
<tr>
<th>Month</th>
<th>Arrival to triage</th>
<th>Arrival to room</th>
<th>Arrival to provider</th>
<th>Total registered</th>
<th>LWBS</th>
<th>% LWBS</th>
<th>LOS median</th>
<th>AMA</th>
<th>% AMA</th>
<th>Elopement</th>
<th>% Elopement</th>
<th>Antibiotic pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>33</td>
<td>49</td>
<td>95</td>
<td>11,703</td>
<td>316</td>
<td>2.70</td>
<td>271</td>
<td>20</td>
<td>0.200</td>
<td>684</td>
<td>5.80</td>
<td>BP</td>
</tr>
<tr>
<td>Feb</td>
<td>28</td>
<td>43</td>
<td>92</td>
<td>10,088</td>
<td>242</td>
<td>2.30</td>
<td>239</td>
<td>23</td>
<td>0.200</td>
<td>475</td>
<td>4.70</td>
<td>BP</td>
</tr>
<tr>
<td>Mar</td>
<td>24</td>
<td>33</td>
<td>79</td>
<td>10,523</td>
<td>219</td>
<td>2.00</td>
<td>215</td>
<td>14</td>
<td>0.100</td>
<td>484</td>
<td>4.60</td>
<td>BP</td>
</tr>
<tr>
<td>Apr</td>
<td>21</td>
<td>26</td>
<td>70</td>
<td>7,722</td>
<td>153</td>
<td>2.10</td>
<td>240</td>
<td>8</td>
<td>0.100</td>
<td>156</td>
<td>2.00</td>
<td>BP</td>
</tr>
<tr>
<td>May</td>
<td>19</td>
<td>24</td>
<td>63</td>
<td>4,662</td>
<td>126</td>
<td>1.60</td>
<td>173</td>
<td>23</td>
<td>0.300</td>
<td>126</td>
<td>1.60</td>
<td>BP</td>
</tr>
<tr>
<td>Jun</td>
<td>18</td>
<td>24</td>
<td>61</td>
<td>7,235</td>
<td>154</td>
<td>2.10</td>
<td>170</td>
<td>20</td>
<td>0.300</td>
<td>154</td>
<td>2.10</td>
<td>BP</td>
</tr>
<tr>
<td>Jul</td>
<td>18</td>
<td>24</td>
<td>63</td>
<td>7,274</td>
<td>178</td>
<td>2.40</td>
<td>184</td>
<td>13</td>
<td>0.200</td>
<td>178</td>
<td>2.40</td>
<td>BP</td>
</tr>
<tr>
<td>Aug</td>
<td>18</td>
<td>28</td>
<td>62</td>
<td>7,168</td>
<td>154</td>
<td>2.10</td>
<td>184</td>
<td>27</td>
<td>0.400</td>
<td>154</td>
<td>2.10</td>
<td>BP</td>
</tr>
<tr>
<td>Sep</td>
<td>18</td>
<td>27</td>
<td>53</td>
<td>7,093</td>
<td>132</td>
<td>1.90</td>
<td>173</td>
<td>19</td>
<td>0.300</td>
<td>053</td>
<td>1.90</td>
<td>BP</td>
</tr>
<tr>
<td>Oct</td>
<td>16</td>
<td>21</td>
<td>49</td>
<td>6,846</td>
<td>121</td>
<td>1.80</td>
<td>163</td>
<td>11</td>
<td>0.200</td>
<td>121</td>
<td>1.80</td>
<td>BP</td>
</tr>
<tr>
<td>Nov</td>
<td>16</td>
<td>21</td>
<td>49</td>
<td>6,656</td>
<td>98</td>
<td>1.50</td>
<td>13</td>
<td>13</td>
<td>0.200</td>
<td>90</td>
<td>1.50</td>
<td>BP</td>
</tr>
<tr>
<td>Dec</td>
<td>16</td>
<td>21</td>
<td>49</td>
<td>7,042</td>
<td>123</td>
<td>1.70</td>
<td>7</td>
<td>7</td>
<td>0.200</td>
<td>123</td>
<td>1.70</td>
<td>BP</td>
</tr>
<tr>
<td>Average</td>
<td>21</td>
<td>30</td>
<td>69</td>
<td>97,012</td>
<td>2,019</td>
<td>198</td>
<td>2,885</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BP</td>
</tr>
</tbody>
</table>

*Note.* BP = Best practice.
The application of the theory of constraints and the concept “Time is Satisfaction,” was used to guide the project focusing on patient throughput in the ED. The premise is that as front-end throughput improves, there will be increased patient satisfaction as well as improvement in state, federal, and department metrics such as time to be seen, left without being seen, and length of stay.
REVIEW OF LITERATURE

The investigator utilized databases provided by the California State University Consortium for Doctor of Nursing Practice including EBSCOHost database, Cochrane Reviews, CINAHL & MEDLINE, Google World Wide Web search engine, and Google Scholar to list updated and comprehensive topics pertinent to the project. Keywords specifically used were: Emergency Department, Emergency Room, Emergency Services; relative to throughput, flow, triage, patient satisfaction, acute care nurse practitioner, nurse practitioner, NP, and metrics. The search was limited to the English language and published information within the last 5 years, unless it was considered a milestone study. Correspondence letters from field experts were also used. The investigator continually reviewed the literature for relevant, newly published studies during the course of the project.

Terms

The project identified common terms and definitions used throughout the paper (see Table 2).

Proposed Solutions in the Literature

The position statement of the American Academy of Emergency Medicine (AAEM) indicates that ED crowding is a national problem that affects the quality of health care for every American because it limits the continuous access to high quality care, and is the result of hospital capacity failure. The statement further emphasized that hospitals need to invest time and resources to address this failure. Recommended solutions were the implementation of flow management, process mapping, workflow diagrams, and bedside registration (Eitel, Rudkin, Malvehy, Killen, & Pines, 2010).
### Table 2

**Common ED Terms and Definitions**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number patients</td>
<td>Total number of patient visits</td>
</tr>
<tr>
<td>Door to provider times</td>
<td>Measure of time in minutes when the patient arrived in the ED to the moment when the patient was seen by a provider</td>
</tr>
<tr>
<td>Left without being seen (LWBS)</td>
<td>Measure of patients who presented to the ED requesting care but left without being evaluated by the provider</td>
</tr>
<tr>
<td>Elopement</td>
<td>Measure of patients who left the ED after provider evaluation but without proper discharge or disposition</td>
</tr>
<tr>
<td>Length of Stay times</td>
<td>Measure of the total length of time in minutes between patient arrival to patient department from the ED</td>
</tr>
<tr>
<td>Against Medical Advice (AMA)</td>
<td>Number of patients who left the ED against the medical advice of the provider</td>
</tr>
<tr>
<td>Treatment time</td>
<td>Measure of time in minutes when the patient was provided treatment</td>
</tr>
<tr>
<td>Time to first antibiotics</td>
<td></td>
</tr>
<tr>
<td>Emergency Severity Index (ESI)</td>
<td>Patient acuity severity scale used by the ED</td>
</tr>
<tr>
<td>ESI 1</td>
<td>Immediate lifesaving interventions</td>
</tr>
<tr>
<td>ESI 2</td>
<td>High risk situations e.g. confused, disoriented, lethargic, severe pain, distress</td>
</tr>
<tr>
<td>ESI 3 to ESI 5</td>
<td>ESI 3 excludes the conditions in ESI level 1 and 2. Anticipatory resources in the ED e.g. laboratory, x-ray</td>
</tr>
<tr>
<td>ESI 3</td>
<td>Requires 2 or more resources</td>
</tr>
<tr>
<td>ESI 4</td>
<td>Requires 1 resource</td>
</tr>
<tr>
<td>ESI 5</td>
<td>Requires 0 resources</td>
</tr>
<tr>
<td>Medical Screening Exam (MSE)</td>
<td>Serves as the documentation for provider time. “Can involve a wide spectrum of actions, ranging from a simple process involving a brief history and physical exam to a complex process that also involves performing ancillary studies and procedures” (CMS, 2009, p. 20).</td>
</tr>
</tbody>
</table>

The traditional serial registration intake has also been considered a constraint in the ED front-end flow (Wiler et al., 2010). Since the Emergency Medical Treatment and
Labor Act (EMTALA) prohibits insurance inquiry before treatment, bedside registration concurrent with treatment, as opposed to serial registration after the medical screening exam (MSE) or treatment has also been a proposed solution (Eitel et al., 2010).

However, the law in California is more restrictive; the California Health and Safety Code 1317(d) states “Emergency services and care shall be rendered without first questioning the patient or any other person as to his or her ability to pay therefor” (State of California, Office of Legislative Counsel, n.d., para. 25). Thus, the patient first needs to be examined by a qualified provider before any type of payor inquiry. This constraint can additionally hamper entrance into care.

This project recognizes that there is no single solution to improving the ED throughput. Wiler et al. (2010) predicated the need for various solutions to streamlining flow in the ED. Interventions such as immediate bedding, bedside registration, advanced triage protocols, practitioner at triage, dedicated “fast track” service line, and tracking systems have been offered as potential solutions to streamlining the front-end processing of ED patients.

**Time is Satisfaction**

As with brilliant ED catch phrases to emphasize the severity of the situation like “time is muscle” (Antman, 2008), “time is brain” (Saver, 2006), and “time is testicle” (Tamkin, n.d.), this project will also use an adage to reflect the criticality of being seen quickly. “Time is satisfaction” will be the driving force of this project to emphasize that patients need to be seen immediately before they lose satisfaction.
Emergency Severity Index

The Emergency Severity Index (ESI; Wuerz et al., 2000) was developed in the 1990s to categorize patients on a 5-point index and facilitate assignment of resources appropriate to the patient’s condition. Version 4 (2012) is the newest revision of the scale with assigned ESI levels in an inverse relationship to patient’s acuity and required resources. For example, an ESI 1 patient requires immediate life-saving intervention. An ESI 2 patient is in a high-risk situation, confused/lethargic/disoriented, or in severe pain/distress. In ESI 3-5 the conditions listed in ESI 1 and 2 are excluded, and the patient is categorized based on anticipated resources utilization; an ESI 3 patient requires a minimum of two anticipatory resources, an ESI 4 patient requires one resource, and an ESI 5 patient requires none (Gilboy, Tanabe, Travers, & Rosenau, 2011). This system does not dictate a specific time to treatment; rather it prioritizes care based on the severity of the patient’s condition.

Innovative Triage

Jensen and Crane (2008) proposed that when attempting to improve front-end flow, the first key areas to evaluate are triage and patient intake. They further acknowledged that “triage” is a department function, not a place. Questions regarding the components of triage actually adding value and efficacy to the patient encounter were raised. The researchers then extrapolated that triage may be a source of the bottleneck to patient flow if this process is not optimized. The process redesign of University of California San Diego Medical Center’s, Rapid Entry, and Accelerated Triage (REACT) included patient identification tracking, integrated computer interfaces to eliminate up-front registration tasks, immediate placement of patients in open ED beds, and physician-
directed ancillary testing and care at triage when no ED beds were available (Chan, Killeen, Kelly, & Gus, 2005). The initiation of REACT process significantly decreased LWBS rates, average wait times and length of stay, despite an overall increase in patient census. Patient satisfaction was not reported.

**Pivot Nurse**

Emergency departments have a mandated responsibility to treat any presenting individual to its department regardless of their ability to pay (CMS, 2009) as clearly defined in the Emergency Medical Treatment & Labor Act (EMTALA) of 1986. However, patient identifiers are required to initiate ED treatment and diagnostics. Thus, a commonly applied abbreviated registration process uses a greeter or pivot nurse (Martin, 2012) who obtains the patient’s name, date of birth, and partial (last four) social security number to generate an armband identification in order to immediately perform diagnostics without asking for any insurance information.

The role of pivot registered nurse (RN) has been instituted in a number of EDs (Martin, 2012). The pivot nurse is the first clinical contact responsible for obtaining a chief complaint, gathering the minimum subjective and objective data to determine triage acuity, and then expediting entry into the registrations system and the department. Although implemented slightly differently between institutions, the pivot RN determines the need for immediate care.

**Abbreviated Triage**

Abbreviated triage has increasingly been adapted into practice due to its recognition of importance in quickly moving the patient through to definitive care compared to traditional lengthy triage. With abbreviated triage, RNs now only obtain a
single phrase chief complaint, allergies, pain scale, vital signs, and ESI level to facilitate the triage requirements (Kulis, Gunther, & Nestor, 2011; Welch, 2010). A military hospital which utilized “mini-triage” decreased their door to provider time by 63% with a correlation of 90% decrease in patient complaints regarding wait times (Kulis et al., 2011).

**Team Triage**

Team triaging has been introduced to eliminate sequential pathways; wherein the team performs not only the initial triage, but also initiates more advanced diagnostics and treatment at the same time. Team triage has been in the literature with variations of the “team” composition including RNs, emergency medical technicians (EMT), and providers consisting of nurse practitioners (NP), physician assistants (PA), or physicians (Jensen & Crane, 2008; Welch, 2010; Wiler et al., 2010). Its success has been attributed to significant decreases in wait times, length of stay, left without being seen, and patient dissatisfaction (Shea & Hoyt, 2012; Welch, 2010).

**Bedside Triage: Pull ‘til Full**

More recently patients are being directly bedded, or brought straight to treatment rooms instead of waiting for triage when there are available rooms. This concept of bedside triage, immediate bedding, or “pull ‘til full” model of eliminating the logistical triage area when there is bed availability has shown promising results (Chan et al., 2005; Welch, 2010). The patient is processed immediately, brought directly to a bed without the time-consuming upfront triage. In theory, this process translates to being seen sooner by the provider, facilitates immediate treatment, and reduces front-end bottleneck volume (Twanmoh, 2005; Welch, 2010).
Medical Screening Exams in the Triage Area

Another innovative model is moving the provider up front to the triage area. Since 2007, the National Hospital Ambulatory Medical Care Survey (NHAMCS) redefined the phrase of *left without being seen* to *left without being seen before and after the MSE* (Niska et al., 2010). A medical screening exam “can involve a wide spectrum of actions, ranging from a simple process involving only a brief history and physical examination to a complex process that also involves performing ancillary studies and procedures” (CMS, 2009, p. 20). MSE in triage by qualified providers such as physicians, NPs and PAs have satisfied the metrics and expedited immediate treatment. Studies have shown the effectiveness of strategically placing a clinician in the triage area for MSEs and subsequent management of non-urgent illness. This process has shown statistically significant decreases in wait times, length of stay, and LWBS (Partovi, Nelson, Bryan, & Walsh, 2001; Soremekun, Terwiesch, & Pines, 2011; Travers & Lee, 2006).

Nurse Practitioners

The NP is an advanced practice registered nurse who possesses additional preparation and skills in physical diagnosis, psychosocial assessment, and management of health-illness needs (Board of Registered Nursing, 2011). These advance practice nurses generate, collect, and integrate data from a wide variety of sources in order to make clinical judgments and decisions about appropriate orders, procedures, and treatments through evidence based practice (American Association of Critical-Care Nurses [AACN], 2012).
Nurse practitioners functioning in EDs are now becoming increasingly prominent in the United States, United Kingdom, and Australia (Dinh, Walker, Parameswaran, & Engright, 2012; Hooker & McCaig, 1996; Mason, Fletcher, McCormick, Perrin, & Rigby, 2005). In 2001, NPs employed in the ED were most likely to report certifications as a family nurse practitioner (43%), acute care NP (13%), adult care NP (12%), or pediatric NP (7%; McGinnis, Moore, & Armstrong, 2006). In 2006, only 4% of the total patients seen in the ED were seen by NPs (Niska et al., 2010).

Dinh et al. (2012) stated that ED NPs have provided high quality of care and have received excellent patient satisfaction scores. A systematic review by Carter and Chochinov (2007) also revealed that NPs decreased the wait times to be seen and increased quality of care and patient satisfaction in EDs.

**Acute Care Nurse Practitioners**

Despite being one of the newest subspecialty areas of nurse practitioners, ACNPs are some of the most highly trained of all nurse practitioners with one of the most flexible skill sets (Kleinpell, 2005, p. 211). The AACN (2012) described acute care nurse practitioners (ACNPS) as NPs who have focused education and training in critical care. The ACNP skill and competency levels are determined by patients’ characteristics, health, and identified vulnerabilities. According to AACN (2012), the ACNP has the clinical focus and advanced education to comprehensively assess and manage the complex, acutely ill emergency department patient. This was supported by Kleinpell (2005) who shared that the role was designed to “provide advanced nursing care to patients with complex acute, critical, and chronic health conditions . . . suited for nurses who manage complex patients’ care in high-acuity settings” such as the ED (p. 212).
Training requirements overlap those of the physician. The NP and the physician spend a similar amount of time training for specific required skills and tasks. However because of training requirements, physicians spend more time away from patient care units while the NP spends more time in patient care activities and collaborating with the healthcare team (Hoffman, Tasota, Scharfenberg, Zullo, & Donahoe, 2003). Thus, the ACNP merges the caritas-focused principles of nursing with medical best practices. The ACNP utilizes the principles of nurse practice which advocate for the patient’s best interest on social, spiritual, psychological as well as physical levels. For the nurse practitioner just as with the nurse, a patient should always be treated holistically.

The ACNP’s activities “include history and physical exams, assessment and identification of risk factors, ordering, and interpretation of diagnostic studies, and providing treatment, including medication, to treat the diagnosed illness” (Kira & Steinke, 2006, p. 3). A number of studies have shown that ACNPs can provide comparable care to physicians. In fact, Kira and Steinke (2006) reported that ACNPs frequently provide more cost effective, individualized care than physicians which resulted in increased staff and patient satisfaction.

Acute care nurse practitioners are assuming an increasingly important role in modern healthcare. Because of their high level of training and the fact that they are less costly to employ than physicians, ANCPs are shouldering increasing amount of diagnosis and treatment (AACN, 2012). This includes the use of ACNPs in the ED to address the wide variety of conditions that present for emergency care.

Emergency departments are faced with increasingly difficult, sometimes seemingly insurmountable challenges. These include patients with “limited access to
care, the aging of the population, and chronicity across the life span contribute to the number of vulnerable persons” as well as those who seek and use the ED to treat chronic conditions resulting in an “environment of uncoordinated, high resource utilization, and poorly defined holistic patient outcomes” (AANC, 2014, p. 3). Added to the deficit of primary care physicians and generalists who can address a patient’s multiple needs in an all-encompassing fashion, more patients seek care in EDs. Further, “a mismatch between historical provider characteristics and patient needs is increasing. What has emerged is a need for a provider with unique knowledge, skills, and abilities to manage a patient’s care across the full continuum of acuity and care services” (AACN, 2014, p. 3).

Because of their background in diagnostics, ACNPS are qualified to fulfill critical screening functions in the ED in a manner that non-ACNPs cannot. Kleinpell (2005) mentioned that while family and adult nurse practitioners may work in the hospital, only ACNPs have been educated and trained to manage critically ill patients. Furthermore, the National Organization of Nurse Practitioner Faculties’ position is that the challenge to the clarity of scope of practice for the ANCP and the PCNP (primary care nurse practitioner) is the willingness of some employers to credential NPs to practice beyond their educational preparation and certification. For example, since family NPs are prepared to deliver primary care across the lifespan, some hospitals seek them out to work in emergency department (EDs). Given their primary care-focused NP educational preparation, FNPs could see patients in an ED fast track area who present with present with problems commonly seen in the primary care setting (e.g., otitis media). However if FNPs are expected to provide acute care services that are not consistent with their educational preparation, then they are practicing outside their scope of practice. (2011, p. 2, para. 4)

The increasing influx of acutely ill patients with critical conditions flooding the ED makes the utilization of ACNPs particularly necessary. The ACNP can engage in triage, ensuring that patients with non-emergency conditions are diverted to more long-
terms solutions and assuring that patients who need treatment the most receive it. Cost containment in the ED is of vital importance,

given that hospitals continue to close, or merge and consolidate ED services, and that the number of patients seeking emergency care continues to escalate, on trend appearing across the country in EDs is the role of the NP as a medical screener. (Cole & Kleinpell, 2006, p. 189)

It should be noted that there is a different philosophy and orientation towards nursing in the ED than in non-acute settings. The philosophy is that no matter what signs and symptoms are present, the role of the ED clinician is to assess, diagnose, and treat the patient for any condition that could lead to injury, bodily harm, or death (Schuur & Venkatesh, 2012). Further these authors share that “new models of acute care aiming to improve the use of scarce, intensive, hospital-based services should take into account this change in patient and provider expectations” (Schuur & Venkatesh, 2012, p. 393).

Because of their education and clinical experience, care by an ACNP in the ED still remains the best way to provide clinical expert care with nursing’s holistic focus (Hamric, Hanson, Tracy, & O’Grady, 2014).

**Standardized Procedure and Standardized Order Sets**

A number of nurse practitioners, including ACNPs, are employed by The Hospital. In addition to a core set of privileges that have been approved for all NPs, each specialty role has its own addendum defining the full extent of the functions. The roles and functions of the nurse practitioners in the ED were defined in The Hospital Nurse Practitioner Standardized Procedure (STP-948; Appendix C). The Hospital Interdisciplinary Committee and the Medical Executive Committee approved the standardized procedure. Currently, there are no NPs working in The Hospital’s ED.
Standardized order sets in the hospital have been shown to increase efficiency of the departments, decrease mortality, and improve hospital core measure compliance (Ballard et al., 2008). Standardized order sets are established and permitted by the appropriate governing body of the institution to formulate and integrate best practice for the department who utilize it. The order sets are usually symptoms or complaints based which have a clear parameter and guidelines. The diagnostics or treatments are specific to the department and is utilized by the clinicians. Standardized order set when utilized early can also improve the overall LOS of the patient (Munoz et al., 2011).

**Theory of Constraints**

Goldratt’s (1992) theory of constraints (TOC) concentrates on the efficiency of all the processes of the system as a whole, rather than the efficiency of any one single process (Taylor & Nayak, 2012). The TOC has an underlying concept that the entire production’s rate or strength is dependent on its weakest link or constraint. Therefore, to realize the full capability of the system one must identify the constraint and correct it. The identification of the constraints sometimes may be challenging, thus Goldratt implemented the “Thinking Process.”

Using the Thinking Process, a series of steps must be produced to identify the constraint or “what to change,” formulate a solution or “what to change to,” and implement the change or “how to make the change.” To identify what to change, a list of undesirable effects (UDE) must be created. The UDEs are the problems or issues that are apparent in the system. Once the UDEs are listed, then they are constructed into a series of logical cause and effect. The UDE cause and effect diagram then forms a current
reality tree (CRT; Appendix D). At the periphery of the CRT are the UDEs as the core problems of the system.

Once the CRT is realized, the next step is to turn each negative connotation (UDE) into a positive statement, thus creating a desirable effect (DE). By switching to the DE, the CRT is transformed into the future reality tree (FRT; Appendix E). The solutions or “injections” for transforming UDE into DE is termed the evaporating cloud (EC; Appendix F).

Hence, the theory of constraints looks at the whole system, and recognizing undesirable effects, and analyzes for the possible connections of those effects to obtain core problems inherent in the system. With proper management of the solutions for the undesired effects, the system in turn becomes a system of positives, which is the desired future of the entity.
PROJECT DESIGN

In the production of the ED throughput process map guideline, the investigator reviewed retrospective aggregate de-identified data measures of The Hospital’s ED. The measures were (a) the arrival to triage, (b) arrival to room, (c) arrival to provider, (d) total registered patients, (e) LOS, (f) LWBS, (g) LWBS percentage, (h) against medical advice (AMA), (i) AMA percentage, (j) elopement, (k) elopement percentage, and (l) antibiotic for pneumonia. The investigator devoted time in the department and observed trends, analyzed systems, and logistics currently employed by The Hospital ED. A process flow and identification of deficiencies was elucidated. Site visits to two southern California EDs were utilized for collaboration and evaluation of other processes currently practiced. Recommendations for re-organization were explored using a combination of comprehensive evidence based principles and innovative techniques.

Setting and Resources

The project evaluated the ED of The Hospital in California. The Hospital is one of the largest and busiest hospitals in California. This large not-for-profit, values-based Catholic healthcare provider has an intrinsic tradition and commitment to excellence. The institution prides itself in pursuing “Perfect Care” through the integration of best practices, a focus on leading-edge research, investment in the latest medical technology, and responsiveness to community needs. The Hospital’s 53-bed ED is the busiest in a southern California county and second busiest in the state of California in emergency services; it served more than 117,000 patients in 2012 (The Hospital, 2013).
Data Source

This process improvement project used The Hospital’s fiscal year 2013 aggregated, de-identified patient data to determine the extent of the problem and guide recommendations. The Hospital will use this data source for evaluation subsequent to implementation for measurement of outcomes. The ED Executive Director and the Director’s Executive Secretary provided data. All electronic information was kept in a password protected Apple Mac Book at the investigator’s personal residence.

Ethics and Human Subjects Protection

Per The Hospital and California State University, Los Angeles Institutional Review Boards (IRB) the data did not involve human subjects. This project was classified as exempt by both entities with no IRB approval required (Appendix G and Appendix H).

Measures

The project analyzed the de-identified ED of the The Hospital metrics from 2013. The metrics look at the aggregate data of patients who arrive in the ED via non-ambulance modalities. The measures were (a) the arrival to triage, (b) arrival to room, (c) arrival to provider, (d) total registered patients, (e) LOS, (f) LWBS, (g) LWBS percentage, (h), against medical advice (AMA), (i) AMA percentage, (j) elopement, (k) elopement percentage, and (l) antibiotic for pneumonia.

Arrival to triage was the measure of time in minutes when the patient arrived in the ED up to the time when the RN assessed the patient. Arrival to room was the measure of time in minutes when the patient arrived in the ED up to the time the patient was brought to the ED room. The arrival to provider time was the measure of time in
minutes when the patient arrived in the ED up to the time when a provider saw the patient. Left without being seen was the amount of patients who presented to the ED requesting care but left without being evaluated by the provider. LWBS percentage was the rate of LWBS patients to the total number of registered patients. AMA was number of patients who left the ED against the medical advice of the provider. AMA percentage is the percentage of patients who left AMA to the total number of registered patients during the month. Elopement was the measure of patients who left the ED after provider evaluation without proper discharge or disposition. Elopement percentage was the number of patients who left the ED after clinician evaluation without a formal discharge disposition to the total number of registered patients during the month. Length of stay time was the measure of the total length of time in minutes between patient arrival to patient departure from the ED. Antibiotic for pneumonia was the measure of compliance of the department for providing antibiotic treatment within a certain amount of time.
DATA ANALYSIS

The ED Scorecard (Table 1) for The Hospital in 2013 shows the results for the measures relating to the functioning of the ED between January 2013 and December 2013. This table highlights the performance of The Hospital ED through the comparison of average measures against the target times as a percentage.

Clearly, The Hospital ED is a busy department, registering 97,012 patients over the course of the time period January to December 2013 (Figure 1). Also the flow of patients utilizing the ED services was not constant over the course of the year, ranging from a monthly low of 6,656 patients in November to a monthly high of 11,703 patients registered in January.

![Patients Registered]

*Figure 1.* The Hospital ED total patients registered 2013.

The Hospital ED had an average arrival to triage time of 21 minutes and this needs 77% improvement to achieve the target time of 5 minutes. The lowest monthly average was in October, with 16 minutes; the highest monthly average was in January, at 33 minutes. This metric data was not available on the scorecard for the months of
November and December because medical record-census reconciliation was not complete at the time of data analysis.

The average arrival to room time over the course of the year was 30 minutes, and this needs 30% improvement to achieve the target time of 21 minutes. As with the arrival to triage time, the lowest monthly average was 21 minutes in October and the highest monthly average of 49 minutes in January.

The measured time for arrival to provider needs a 36% improvement to achieve the target time of 44 minutes (Figure 2). This metric also shows seasonal variation pattern that is lowest in October with 45 minutes and highest in January with 69 minutes. This metric data was not available on the scorecard for the months of November and December because medical record-census reconciliation was not complete at the time of data analysis.

![Figure 2. The Hospital ED arrival to provider 2013.](image)

The rate of patients LWBS ranged from a low of 1.5% in November to a high of 2.7% in January. The average median of LWBS was 2.02%, and needs 45%
improvement to achieve the target percentage of 1.1%. The rate of patients leaving AMA however is generally much lower, ranging from a low of 0.1% to a high of 0.4% over the course of the year and is at best practice target.

The median LOS ranged from the lowest in October with 164 minutes to the highest in January with 271 minutes (Figure 3). Across the year, the median LOS averaged 201 minutes, and this needs a 25% improvement to achieve the target time of 151 minutes. Seasonal variations are also noted, as the LOS is shorter during the warm months and increases during the colder months.

![Median LOS (mins)](image)

*Figure 3. The Hospital ED median length of stay 2013.*

The rate of elopement also reached a high in January. There were 684 (5.8%) elopements for that month compared to the lowest monthly elopement of 98 (1.5%) during November 2013. The yearly average elopement rate was 2.68% and this needs 25% improvement to achieve the target benchmark of 2% elopement.

The Hospital ED in 2013 had a 100% Perfect Care pneumonia performance report. Therefore, the most urgent issues to address are the metrics that need
improvement of 25% or more for the target achievement specifically: LOS, arrival to provider time, arrival to room time, arrival to triage time, LWBS percentage, and elopement percentage.

**Project Outcomes**

**Standard Order Set**

An emergency department standard order set was developed specific to the needs of the triage area of The Hospital. Organized by chief complaints and symptoms, the order set provides a specific set of diagnostic and evidence based interventions (Appendix B). The order set was selected for clarity and ease of implementation and is in alignment with The Hospital standardized procedure for nurse practitioners.

**Process Map Guideline**

A process map guideline for ACNP use was developed (Appendix A). Derived from the theory of constraints, this guideline is based on an evaluation and synthesis of ED throughput literature (Eitel et al., 2010) and The Hospital data. Once implemented, this guideline can be used to facilitate patient flow in the ED.

**Theory to Determine the Solutions**

The theory of constraints was used to guide the project (Taylor & Nayak, 2012). First, a list of the undesirable effects (UDEs) must be created relative to The Hospital ED throughput. Then all of the UDEs are connected using the “if-then” syntax to create a current reality tree (CRT; Appendix D). For example the UDEs “we do not properly have a front-end throughput” and “patients wait 21 minutes to be triaged” will be essentially stated as follows: If we do not properly have a front-end throughput, then the patients wait 21 minutes to be discharged. Thus, the CRT depicts the relationship
between the UDEs, starting from the root cause “we do not properly have a front-end throughput” and culminating in the eventual effect “The Hospital has decreased revenue.” The CRT also depicts the current unsuccessful system of The Hospital ED.

For The Hospital to achieve an effective and successful system, the UDEs need to be improved to become desirable effects (DEs). The DEs are essentially the inverse properties of the UDEs. The UDEs are converted to desirable effects, for example the UDE “we do not properly have a front-end throughput” will be converted to a DE “we will appropriately have a front-end throughput.” Likewise the UDE “patients wait 69 minutes to see a provider” will be converted to a DE “patients will be seen within 30 minutes by a provider.” Once all the DEs are connected using if-then syntax, a future reality tree (FRT) is constructed (Appendix E). This FRT depicts the relationship between the DEs, starting from “we will properly have a front-end throughput” and culminating in the eventual effect “The Hospital will be successful and profitable.” The FRT depicts the future reality that the system demands to accomplish.

The theory states that injections or interventions are to be applied to UDEs to become DEs in order for the system to improve. The solutions for transforming the UDEs to DEs involve determining the interventions to achieve success of the principal DE “we will appropriately have a front-end throughput.” The three injections selected were “acute care nurse practitioner in triage,” “time is satisfaction, innovative triage guideline,” and “standardized protocol order set in triage.” The outcome of the injections on the principal DE will be front-end metrics will improve (Appendix F).

The Time is Satisfaction, Innovative Triage process map guideline (Appendix A) produced by the investigator is derived from the theory of constraints. It follows the
theory if-then syntax and addresses strategies to improve the department UDEs. Specifically, these include the unfavorable measures of (a) the arrival to triage, (b) arrival to room, (c) arrival to provider, (d) left without being seen rates, (e) elopement rates, and (f) LOS.
DISCUSSION

The Hospital’s ED is considered a large volume (>45,001 patient visits per year) department (Vukmir & Howell, 2010), which increases issues of patient throughput. Variations in the census make a single solution ineffective and impractical. Physical layout of the triage area and available informatics also provides challenges to determining effective solutions. Throughput has been previously addressed in the ED and implemented solutions include a satellite laboratory dedicated to the ED (Lee-Lewandrowski et al., 2003) and flexible staffing to meet the demands of the patient volume (American College of Emergency Physicians [ACEP], 2006).

The Hospital ED front-end throughput has been inadequately managed. Arrival to triage time was 77% below the targeted goal. Despite the implementation of a pivot nurse, time to triage continued to demonstrate wide variation. Delays in initial intake can be in part attributed to patient surge (multiple patients arriving at the same time; ACEP, 2011 clarify date). The ACEP (2006) in their paper “Approaching Full Capacity in the Emergency Department” reported that in order to effectively deal with surges in volume, a flexible RN team added to triage staffing must be available. This process requires that RNs can be quickly mobilized to the triage area and by extension not be highly involved in patient care elsewhere in the department. However, an increased cost of care is associated with this process and may not be feasible in a time of cost containment and limited resources (ACEP, 2008).

The Hospital ED’s door to provider measure was only at 63% of the target time 44 minutes. Despite three additional RNs in triage during times of patient surge to accelerate the throughput, patients still wait 69 minutes on average to be seen by a
provider. One of the solutions to this issue is to then move the provider in the triage area (ACEP 2006, 2008). However, the shortage of emergency medicine-trained physicians (Ginde, Sullivan, & Camargo, 2009) has made this solution less realistic.

The patient satisfaction for The Hospital ED was only 67.5% for the month of January 2013. This is likely attributed to increased wait times, LOS, and LWBS (Cooke et al., 2006; Welch, 2010) during the busiest month of the year. Patient dissatisfaction was high despite implementation of additional staffing such as Rapid Assessment and Discharge in Triage (RADIT; Vega & McGuire, 2007) to compensate for the increased patient volume. The RADIT program is a team consisting of a physician, RN, and EMT functioning in triage starting at 2 p.m.-10:30 p.m. during the winter months, the busiest season of the year. However, the RADIT program “focused on patients with nonurgent complaints” (Vega & McGuire, p. 21) and tried to solely manage ESI 4-5 patients without employing the fast track unit. This creates further bottleneck in the process as the team gets inundated with the responsibility of both screening the patients and managing them. Another demise to the RADIT program is its incongruent starting time compared with the patient surge time. At 2 p.m., The Hospital ED is already beyond capacity, and patients may have already been waiting for hours as the surge historically starts at 10am (McCarthy et al., 2008; Siler Fisher et al., 2005). The RADIT team is already trying to catch up with treatment and diagnostics the very moment it starts.

Immediate collection of diagnostic results is crucial to improving the throughput (ACEP, 2006, 2008; Welch, 2010). Thus, initiating the diagnostics early on the patient visit can improve this process. However, The Hospital ED lacks a standardized protocol to initiate these tests, therefore it creates unnecessary wait times because it is started late.
Additionally, when The Hospital ED reaches full capacity, the wait times for these diagnostic results also increase.

Both arrival to triage and arrival to room times increase as the average number of patients registered in the ED increases. The ED patient volume also increases in an hourly basis starting before noon (McCarthy et al., 2008; Siler Fisher et al., 2005) as well as through seasonal variations (Manfredini et al., 2009; McLaughlin et al., 2005). These constraints also have an additive effect on delaying the time of arrival to provider as longer wait times seem to be a result of ED overcrowding occurring during the busiest times of the day and the year. Significant speeding up of the arrival-to-triage process is necessary at The Hospital ED if this average time is to be brought even close to the target of 5 minutes.

The other undesirable effects of The Hospital ED throughput system identified in this study are (a) LWBS rates, (b) LOS times, and (c) elopement rates. These UDEs are the result of the preceding constraints affected by the surge of the ED volume.

Overall, the data examined for The Hospital demonstrates that there is a clear need to reduce waiting times to federal metric levels, as this is a particularly pressing need in terms of front-end triage. Implementing changes to the front-end throughput, utilizing the ACNP, using the theory of constraints, and the “time is satisfaction” slogan, can be applied to the case of The Hospital with the aim of improving ED metrics towards best practice.

Overcrowding of EDs is a nationwide problem, and despite federal metrics, the average patient waiting times have increased over the past 20 years. Because patient satisfaction scores are dependent on wait times and LOS in the department, the
subsequent scores will improve if the patient is moved or processed through the ED more efficiently.

The solutions recommended for the front-end ED throughput include utilizing (a) the pivot RN, (b) ESI levels, (c) pull ‘til full, (d) team triage, (e) abbreviated triage, (f) acute care nurse practitioner, and (g) protocol order sheet (Appendix B). Consistent with the theory of constraints, this project utilizes the if-then syntax. These were all combined to produce the Time is Satisfaction, Innovative Triage process map guideline (Appendix A). This process map guideline serves to improve the constraints afflicting the front-end throughput of The Hospital ED.

The project focuses on the effectiveness of each of the solutions. These interventions were then connected to construct the Time is Satisfaction, Innovative Triage process map guideline (Appendix A) to show the relationship among the solutions. As such the project becomes construct of if-then interventions.

If a patient presents to the ED, then he/she is encountered by pivot RN. The pivot RN then assigns the Emergency Severity Index (ESI) triage levels 1 through 5 for the patient. If the patient is ESI level 1, then the patient is directed immediately to the main ED where lifesaving interventions are started. If the patient is ESI 2-5 then the pivot RN initiates the pull ‘til full solution. The ESI level 2-3 patients are directed to the main ED while the ESI level 4 patient is directed to the fast track area. The patients are evaluated and started on treatment and diagnostic orders. The ESI level 5 patient is encountered by the team triage consisting of (a) acute care nurse practitioner, (b) RN, and (c) EMT. The triage team then utilizes solutions of abbreviated triage, MSE, and confirms that patient is
an ESI level 5. Care is provided then ESI level 5 patient is directed to the waiting area to be discharged.

If The Hospital ED is full, then the pivot RN directs the ESI level 2-5 patients to the team triage while the ESI level 1 patient is still directed immediately to the main ED for life-saving interventions. The team triage will utilize the abbreviated triage, MSE, and confirm ESI levels. Then the team triage will initiate the solution of standard protocol order sheet to the ESI level 2-4 patients. The patients receive treatment and started on diagnostic tests while they wait for the ED or fast track area to have available space. The ESI level 5 patient is encountered by the team triage where they utilize solutions of abbreviated triage, MSE, and confirms that patient is an ESI level 5. Care is provided then the ESI level 5 patient is directed to the waiting area to be discharged.

The ESI 1-4 level patients are eventually selected to disposition for admission, transfer, or discharge.

The UDEs may be improved by the implementation of the time is satisfaction innovative triage. The use of the pivot nurse as a first contact, and employing the ESI levels prior to triage will improve the arrival to triage constraint by properly directing the patient into the flow process. Another proposed improvement to the arrival to triage and arrival to room constraints is pull 'til full when there is bed availability. These procedures can also manage the other constraints such as: arrival to provider, LWBS rates, LOS, and elopement rates by expediting the patients directly to the main ED or fast track area where they are seen by a provider quickly (Twanmoh, 2005; Welch, 2010).

The team triage that utilizes abbreviated triage, employs an ACNP, and follows a protocol order sheet is a solution for the front-end throughput. A properly educated and
trained provider in an acute setting such as an ACNP in triage role is the principal solution for this project (ACEP, 2006, 2008). Through utilizing an ACNP with his/her training and experience in critical care and high acuity settings, the patient is provided with immediate access to diagnostic studies and advanced management earlier during their ED stay, even during times of increased patient volume and Hospital ED capacity. Nursing has always been an essential component of the healthcare team. Now by placing an ACNP in The Hospital ED, nursing is once again at the forefront of changes and evolving health care issues. All of these interventions are focused on providing maximum output with minimal time and its success is dictated by improving the metrics.

The evaluation of the process will be the comparison of the metrics after implementation, initially on a monthly, then yearly basis. Metrics specifically expected to improve are the (a) arrival to triage times, (b) arrival to provider times, (c) LWBS rates, (d) arrival to room times, (e) LOS times, (f) elopement rates, and (g) patient dissatisfaction scores.

Anticipation of additional ACNP led triage teams may be dictated by increasing patient volume. The project anticipates for The Hospital ED to continue to see even higher volumes of patients without compromising these metrics in the future. Additionally as the front-end throughput is improved, the overall throughput of the ED should improve similarly, as patients would have their diagnostic results earlier and have their ED management started quicker.

Although the project was specifically targeted to a very busy ED in southern California, the anticipated outcomes may be replicated in other institutions if the processes and conditions are similar. For a successful utilization of the project outcome,
administrators, nursing personnel, and medical staff all must recognize the issues of the department and realize that at the core of it is the delivery of excellent patient care.
RECOMMENDATIONS

Interventions such as (a) immediate bedding, (b) pivot nurse, (c) innovative triaging, (d) abbreviated triaging, (e) team triage, ACNP at triage, and (f) triage protocol order set have been offered as potential solutions. Implementation of these interventions would be expected to streamline the front-end processing throughput of ED patients.

The recommendation for The Hospital ED is to apply the Time is Satisfaction, Innovative Triage process map guideline (Appendix A). This should greatly assist in the process of the front-end of the department and provide guidance for improving the overall department throughput. Specific recommendations are as follows:

1. Acknowledge the Time is Satisfaction slogan. The ED recognizes that the patients’ wait times and LOS times correspond to the patients’ satisfaction.

2. Default to Pull ‘til full. Immediate bedding whenever possible. This recommendation optimizes flow of the front-end throughput and reduces the anticipated bottleneck in triage when there are beds available. This recommendation should lead to patients being bedded earlier and being seen by a provider more quickly. This should also decrease the patients’ length of stay in the ED and result in fewer LWBS numbers.

3. Continue with pivot RN role. This recommendation provides the first clinical contact, obtains patient identifiers, chief complaint and initiates the ESI level triaging. This recommendation improves time to triage, sorts out ESI 1 and ESI 5 patients immediately.

4. Utilize team triage and abbreviated triage. Dedicate time (11 a.m.-11 p.m.) and treatment space logistically located in the triage area with a privacy
curtain, and a gurney. The team comprises of an ACNP, an RN, and EMT. The ACNP performs the MSE and initiates Standardized Procedure Order Set in Triage (Appendix B). The triage RN concurrently performs abbreviated triage and verifies ESI. The EMT will obtain necessary 12-lead EKG readings, vital signs, and guides the patient to the requested destination. This intervention corrects lengthy triage practices and matches the predicted patient arrival peak times with ED staffing. This recommendation should produce metric improvement and reduction of time to provider, LWBS, LOS, and patient dissatisfaction.

5. Consolidate team triage and MSE. This recommendation allows staff to make decisions regarding treatment earlier on in the ED throughput process than would typically occur in a hospital without this option. Allows for financial data procurement immediately after the MSE.

6. ACNPs in the front-end allows treatment decisions to be made relatively early in the patient’s ED visit. The ACNP working in triage can start a patient on medications and treatments sooner and allows certain patients to be discharged earlier in the timescale of the overall visit. The presence of ACNPs in the front-end of the ED improves patient satisfaction, as their overall waiting time is reduced and medication for pain or other uncomfortable condition is provided earlier in the course of their stay.

Under the Time is Satisfaction, Innovative triage process map guideline (Appendix A), the ideal ESI patient will have the following pathway:
1. **ESI 1.** Patients who present to the ED requiring immediate life-saving intervention will be encountered by the pivot RN and instantly assigned an ESI 1 level and bedded to the main ED where he/she is encountered by the ED physician and nursing staff. The patient is started on life-saving interventions. Once ready for disposition, the patient is then admitted to the hospital or transferred.

2. **ESI 2.** The pivot RN will immediately encounter the confused, lethargic, and distressed patients who present to the ED. The patient or family then provides patient identifiers, the chief complaint, and is assigned an ESI 2 level. If there is an available bed the patient is bedded immediately. If the main ED is full, the patient will proceed to the treatment space logistically placed in the triage area and is encountered by the team triage. The team triage will utilize abbreviated triage, MSE, and initiates standardized procedure order set. The patient will remain under the team triage care until bedded in the main ED.

3. **ESI 3.** The pivot RN will immediately encounter the patients who present to the ED requiring at least two anticipated interventions. The patient or family then provides patient identifiers, the chief complaint, and is assigned an ESI 3 level. If there is an available bed the patient is bedded immediately. If the main ED is full, the patient will proceed to the treatment space logistically placed in the triage area and is encountered by the team triage. The team triage will utilize abbreviated triage, MSE, and initiates standardized procedure order set. The patient will remain under the team triage care until bedded in the main ED.
4. ESI 4. The pivot RN will immediately encounter the patients who present to the ED requiring at least one anticipated intervention. The patient or family then provides patient identifiers, chief complaint, assigned an ESI 4 level. The patient is immediately bedded to the fast track area if there is bed availability. If the fast track is full, the patient will proceed to the treatment space logistically placed in the triage area and is encountered by the team triage. The team triage will utilize abbreviated triage, MSE, and initiates standardized procedure order set. The patient will remain under the team triage care until bedded in the fast track area. If the patient is ready for disposition without advancing to the fast track area this patient will be discharged as appropriate.

5. ESI 5. The pivot RN will encounter the patients who require no ED intervention. The patient or family provides patient identifiers, chief complaint, and assigned an ESI 5 level. The patient encounters the team triage will utilize abbreviated triage and MSE. The patient then proceeds to the waiting area to be discharged as appropriate.

The Time Is Satisfaction, Innovative Triage process map guideline of front-end throughput also reduces the number of patients requiring beds in the ED, making more resources available to more acutely ill patients and maximizing the efficiency of existing resource use.
SUMMARY

This project identified the improvement for the front-end ED throughput as a crucial factor in maintaining and improving the department’s performance relative to the stringent federal metrics for ED functioning. Improving throughput should also improve overall patient safety, patient outcomes, and overall reported patient satisfaction with the department and The Hospital. The production of the Time Is Satisfaction, Innovative Triage process map guideline and Standardized Procedure Order Set in Triage involves the utilization of ACNPs in the triage and front-end processes of the ED. The importance of ACNPs within the ED’s functioning was examined, and recommendations for their future use, processes, and functioning were emphasized.
REFERENCES


APPENDIX A
TIME IS SATISFACTION, INNOVATIVE TRIAGE PROCESS MAP GUIDELINE

"Time is satisfaction. Innovative Triage"
## APPENDIX B

### STANDARDIZED PROCEDURE ORDER SET IN TRIAGE

<table>
<thead>
<tr>
<th>Condition</th>
<th>CBC</th>
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<th>Tropinin</th>
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<th>CMP</th>
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<th>EKG</th>
<th>PT</th>
<th>iCPR</th>
<th>Extremity Xray</th>
<th>Cardiac Monitor</th>
<th>ASA</th>
<th>SL MG</th>
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</tbody>
</table>

APPENDIX B
Glossary: 2L/NC = 2 liters of oxygen via nasal cannula; accu^ = blood glucose meter; 
ALOC = altered level of consciousness; ASA = aspirin 162mg; bmp = basic metabolic 
panel; bnp = brain natriuretic peptide; cath UA = urine sample via catheterization; C&S = 
culture and sensitivity; cbc = complete blood count; CT = computed tomography; EKG = 
electrocardiogram; GI = gastrointestinal; IVF = intravenous fluids; NPO = nil per os; OB 
U/S = obstetric ultrasound; pCXR = portable chest x-ray; PT = prothrombin time; pulse 
O2 = pulse oximeter; Rh = Rh factor; RSV = respiratory syncytial virus; RT = respiratory 
therapy; SL NTG = 0.3mg sublingual nitroglycerin; tox = toxicology; u dip = urine 
dipstick analysis; ucg = urine pregnancy test.
APPENDIX C

APPENDIX J OF THE HOSPITAL STANDARDIZED PROCEDURES FOR NURSE PRACTITIONER IN THE ED (STP-948)

ADDENDUM TO APPENDIX J: ACUTE CARE NURSE PRACTITIONER IN THE EMERGENCY DEPARTMENT

I. Patient Conditions:

The nurse practitioner is responsible for coordinating and assisting with the evaluation and management of patients in the Emergency Department setting. The care of these patients is coordinated with the supervising physician, patient, family and other health care professionals.

II. Procedures/Competencies:

The nurse practitioner will communicate with other health care members by documenting in the clinical progress record. Furthermore, the nurse practitioner will communicate all patient care activities with the supervising physician.

The following procedures may be performed by the Nurse Practitioner after demonstrating competency through formal training and direct observation.

1. Advancement and removal of drains
2. Anoscopy
3. Arterial blood gas
4. Cautery use
5. Central line placement
6. Finger tip avulsion management
7. Foreign body removal
8. G-tube replacement
9. Incision and drainage of abscess
10. Intra-articular aspiration and injection
11. Local anesthetic
12. Lumbar puncture
13. Nasal packing
14. Pelvic examination
15. Reduction of joint dislocations
16. Resection of ingrown toenail by wedge procedure
17. Slit lamp evaluation
18. Splinting and strapping
19. Subungal hematoma management with cautery
20. Trigger point injections
21. Wound debridement with local anesthetic
22. Wound stapling with local anesthetic
23. Wound suturing with local anesthetic
APPENDIX D

THE HOSPITAL EMERGENCY DEPARTMENT’S CURRENT REALITY TREE

APPENDIX E

THE HOSPITAL EMERGENCY DEPARTMENT'S FUTURE REALITY TREE

APPENDIX F

SOLUTIONS AND INJECTIONS FOR TRANSFORMATION

APPENDIX G

THE HOSPITAL INSTITUTIONAL REVIEW BOARD APPROVAL

----- Human Research Protections Program
DETERMINATION OF NON-HUMAN SUBJECT RESEARCH

Federal regulations and --- policies require IRB review of research involving human subjects. Activities that meet the regulatory definitions of “research” and “human subjects” constitute human subject research and require IRB approval and oversight, except in cases of exempt research.

| **Project Title:** Time is Patient Satisfaction – The Utilization of Acute Care Nurse Practitioners in the Emergency Department |
| **Investigator:** Ray Gantioque, RN, MSN |

| DETERMINATION OF “RESEARCH” |
| 45 CFR 46.102(d): |

 Research - a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

Do the proposed activities involve a systematic investigation? A “systematic” approach involves a predetermined method or a plan for studying a specific topic, answering a specific question, testing a specific hypothesis, or developing theory. A systematic approach incorporates collection of data, either quantitative or qualitative, or specimens; and analysis.

☒ YES* ☐ NO**

**If NO, please explain why the proposed activities do not involve a systematic approach: _______

1. Is the intent of the proposed activities to develop or contribute to generalizable knowledge? Activities designed to develop or contribute to generalizable knowledge are those activities designed to draw general conclusions, inform policy, or generalize findings beyond a single individual or internal program.

☒ YES* ☐ NO**
**If NO**, please explain the intent of proposed activities and explain how the proposed activities are not intended to contribute to generalizable knowledge: _____

*If YES to both of the above questions, these activities constitute research.*

<table>
<thead>
<tr>
<th>DETERMINATION OF “HUMAN SUBJECT”</th>
</tr>
</thead>
</table>

**45 CFR 46.102(f):**

**Human subject** - a *living individual* about whom an investigator (whether faculty, student, or staff) conducting research obtains: (1) data through *intervention or interaction* with the individual or (2) *identifiable private information.*

*Intervention* includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes.

*Interaction* includes communication or interpersonal contact between researcher and subject.

*Private information* includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place (such as a public restroom), and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, medical record information). Private information must be individually identifiable.

*Individually identifiable* means the identity of the subject is or may readily be ascertained by the investigator or associated with the information; the data contains one or more data elements that can be combined with other reasonably available information to identify an individual (i.e. at least one of the 18 identifiers under the HIPAA Privacy Rule, if an investigator can readily ascertain the identity of the individual).

1. Do the activities involve obtaining information about *living individuals*?
   - YES [ ]
   - NO [ ]

1a. If “Yes” to Question 1, do the activities involve intervention or
interaction with the individuals (i.e., prospective collection of data/specimens) for research purposes that are not otherwise conducted for standard medical care?

☐ YES*  ☒ NO**

*If YES, the activities involve human subjects.
**If NO, the activities DO NOT involve human subjects.

2. Do the activities involve obtaining *individually identifiable* and *private* information about living individuals?

☐ YES*  ☒ NO**

*If YES, the activities involve human subjects.
**If NO, the activities DO NOT involve human subjects.

3. Do the activities involve analysis of existing *data/specimens* (i.e., data/specimens have been collected and are available for analysis)?

☒ YES  ☐ NO

3a. If “yes” to Question 3, will the *data/specimens be coded* such that a link exists that could allow the source of the data/specimens to be re-identified (i.e., key available to decipher the code)?

☐ YES  ☒ NO

3b. If “yes” to Question 3a, is there a written agreement that prohibits the Lead Researcher and his/her research team from having access to the link?

☐ YES  ☒ NO**

**If you answered YES to 3 and 3a and NO to 3b, these activities involve human subjects.

### DETERMINATION OF HUMAN SUBJECTS RESEARCH

☒ The activities as described **DO NOT** constitute Human Subjects Research. Submission of an IRB Application is not required.

☐ The activities as described **DO** constitute Human Subjects Research. Submission of an IRB Application **IS REQUIRED**. IRB Approval must be obtained before the research can begin.
Reviewer: Mary Parga, CIP

Date of review: 9/3/2013

Comments: This study involves the use of already compiled de-identified aggregate data; the PI will not have access to identifiable data as part of this research project.
APPENDIX H

CALIFORNIA STATE UNIVERSITY LOS ANGELES INSTITUTIONAL REVIEW BOARD APPROVAL

Office Memorandum

DATE: March 7, 2014
TO: Elizabeth Winokur/Raymund Gantioque
    Nursing/IHHS
FROM: Elia Amaro, Institutional Review Board—Human Subjects, Coordinator
COPIES TO: S. Ulanoff, Chair; J. Shiotsugu, Executive Secretary
SUBJECT: Review of Project Involving Human Subjects

Applicant: Elizabeth Winokur/Raymund Gantioque
Title: The Emergency of the Department, “Time is Satisfaction” The Utilization of Acute Care Nurse Practitioners in the Emergency Department
Application #: IRB 13-44X
Date of Review: 12/11/14
Administrative Action—Exempt Category #2

IF ANY CHANGES ARE MADE TO THE METHODS AND PROCEDURES DESCRIBED IN THIS PROTOCOL, YOU MUST SUBMIT ANOTHER APPLICATION SO THAT THE PROJECT MAY BE RE-EVALUATED FOR EXEMPTION FROM IRB REVIEW.
## APPENDIX I

### THE EMERGENCY DEPARTMENT TABLE OF EVIDENCE

<table>
<thead>
<tr>
<th>Author Year</th>
<th>Purpose</th>
<th>Design/Key Variables</th>
<th>Sample/Setting</th>
<th>Measures</th>
<th>Key Findings</th>
<th>Author’s Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan, T., Killeen, J., Kelly, D., &amp; Guss, D. (2005).</td>
<td>Sought to determine effect of new triage process, REACT, rapid entry and accelerated care at triage on the frequency of patients who leave before being seen.</td>
<td>Pre and post interventional study.</td>
<td>6-month period before process changes (pre-REACT) and a similar 6-month period 1 year after the intervention (post-REACT) of the ED population at UCSD Medical Center ED.</td>
<td>Average monthly data for proportion of patients who leave before being seen (LWBS), ED census, admissions, and mean monthly length of stay and wait times were compared between the 2 periods.</td>
<td>Frequency of LWBS decreased by 42%, from 1,375 of 17,849 total ED patients (7.7%) during the pre-REACT period to 823 of 18,673 total ED patients (4.4%) during the post-REACT period ($P &lt; .001$).</td>
<td>Study was conducted at an urban academic teaching institution with resident and attending physician staffing, findings may not be applicable to the community setting.</td>
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</table>

Average monthly\% LWBS decreased by an absolute difference of 3.3%. A decrease in the average monthly mean ED length of stay (LOS) for all patients from the pre-REACT to post-REACT periods by 31 minutes (95% CI
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<th>Author Year (citation)</th>
<th>Purpose</th>
<th>Design/Key Variables</th>
<th>Sample/Setting</th>
<th>Measures</th>
<th>Key Findings</th>
<th>Author’s Conclusions</th>
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<tbody>
<tr>
<td>Cheung, P. T., Wiler, J. L., Lowe, R. A., &amp; Ginde, A. A. (2012).</td>
<td>Compare the association between barriers to timely primary care and emergency department (ED) utilization among adults with Medicaid versus private insurance.</td>
<td>Analyzed 230,258 adult participants of the 1999 to 2009 National Health Interview Survey.</td>
<td>National Health Interview Survey data from 1999 to 2009.</td>
<td>Barriers to primary care. Utilization of ED in the past year.</td>
<td>Medicaid beneficiaries were more than twice as likely to have greater than or equal to 1 ED visit (39.6% versus 17.7% for private insurance). For both Medicaid and private insurance beneficiaries, there was an increasing unadjusted association between higher number of barriers and increased ED utilization.</td>
<td>Compared with individuals with private insurance, Medicaid beneficiaries were affected by more barriers to timely primary care and had higher associated ED utilization.</td>
</tr>
<tr>
<td>Hooker et al. (2008).</td>
<td>Understand trends in ED and interprofessional roles in delivery of care.</td>
<td>Retrospective analysis of NHAMCS ED visits from 1995-2004 administered by the NCHS and CDC.</td>
<td>National sample of visits in ED of noninstitutional general and short-stay hospitals in 50 states.</td>
<td>Most frequent diagnoses in ED. Most commonly prescribed class medication. Patient contact</td>
<td>Abdominal pain, Otitis media, URI, chest pain, and acute pharyngitis most common respectively.</td>
<td>Need to identify the optimal labor circumstances for physician/non-physician utilization in the emergency department setting, specifically, staffing configurations,</td>
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<td>Cooke, T., Watt, D., Wertzler, W., &amp; Quan, H. (2006).</td>
<td>Explore emergency department (ED) patient expectations regarding staff communication with patients, wait times, the triage process and information management.</td>
<td>Cross-sectional telephone survey among patients aged 18 years or older who visited 1 of 3 tertiary care EDs in the Calgary Health Region. Conducted a cross-sectional English-language telephone survey among patients aged 18 years or older who visited the EDs in the Calgary Health Region in 2002. Used qualitative focus group methodology in previous study to determine the beliefs and expectations of patients, public and staff regarding an ED visit.</td>
<td>Of the 837 patients surveyed, 76% (95% CI, 74.6%-80.4%) expected updates from ED staff every 30 minutes or less, 51.3% (95% CI, 49.6%-56.4%) believed that patients with non-life threatening problems should wait &lt; 1 hour, 58.3% (95% CI, 56.7%-63.3%) felt that tests should be done within 1 hour, and 44.6% (95% CI, 43% x-</td>
<td>ED patient expectations appear to be similar across all triage levels. Patients value effective communication and short wait times over many other aspects of care. They have expectations for short wait times that are met infrequently and are currently unattainable in many Canadian EDs. Although it may be neither feasible nor desirable to meet all patient expectations, increased focus on wait times and staff communication may increase both ED efficiency and patient satisfaction.</td>
<td>level of supervisory requirements, and whether the promise of inter professional team use can improve efficiency and outcomes.</td>
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<td>Dinh, M., Walker, A., Parameswaran, A., &amp; Enright, N. (2012).</td>
<td>Reports on the quality of care delivered by a fast track unit staffed by both nurse practitioner and emergency doctors using a validated emergency satisfaction rating scale and a standard health outcome survey.</td>
<td>This was an observational study using a convenience sample of emergency patients.</td>
<td>The study was conducted in an inner city district level hospital emergency department in an inner west suburb of Sydney, Australia.</td>
<td>A convenience sample of patients triaged to the fast track unit was used in this study.</td>
<td>The end-point was quality of care measured using both patient reported outcomes and adverse outcomes. These consisted of patient satisfaction scores and overall care rating at the point of discharge, health status at two week follow up and adverse events (missed fractures and unplanned representations to any emergency department within 14 days of initial consultation).</td>
<td>There was a trend to shorter waiting time in the ENP group with a difference of 7 min ($p = 0.06$). Significantly different between study groups with a higher proportion of patients in the ENP group rating their care as excellent compared to DR group (68% vs. 50% Fishers exact $p = 0.02$). Higher patient satisfaction in the ENP group remained statistically significant, with a mean total 49.7% expected to spend no more than 2 hours in the ED. A total of 320 patients were enrolled into the study. Of the 236 patients who submitted completed survey forms, median satisfaction scores were 22 out of 25 with 84% of patients rating care as “excellent” or “very good.” At 2 week follow up, health status score was comparable to normal healthy populations. When comparing study groups, patient satisfaction scores were significantly higher in the ENP group compared to DR group.</td>
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<td>Falvo, T., Grove, L., Stachura, R., &amp; Zirkin (2007).</td>
<td>To develop a practical methods for quantifying the revenues that are potentially lost as a result of patient elopements and ambulance diversion.</td>
<td>A retrospective descriptive statistical analysis of financial and operational data from the ED population. Revenue that could potentially have been generated from providing emergency services to patients who were diverted to other hospitals before</td>
<td>All patients who presented to the ED during FY 2005 were retrospectively sorted into two groups according to their mode of arrival: 1) patients brought to the hospital by EMS ambulances and 2) those arriving by private vehicle, public</td>
<td>The information utilized for these calculations included the mode of arrival, Emergency Severity Index-based acuity level, payer status, and disposition.</td>
<td>Diverted EMS patients who would otherwise have been admitted to the study hospital would each have generated the standard mean inpatient charges of $13,362 and net revenue of $8,551 (median: $5,432).</td>
<td>This community hospital may have lost more than $3,881,506 in revenue as a result of ambulance diversions and patient elopements during the 12-month period described in this analysis.</td>
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<td>Hing E., &amp; Bhuiya, F. (2012).</td>
<td>Evaluate the wait time for treatment in United States Emergency Departments 2009.</td>
<td>Retrospective study.</td>
<td>Retrospective study of National Hospital Ambulatory Medical Care Survey 2009.</td>
<td>Wait times ESI levels.</td>
<td>hospital collected an average of $863 (median: $605) when a patient arriving by transportation, or other methods (referred to as the “walk-in” group). Results were reported as pre-expense (net) revenues.</td>
<td>From 2003-2009, the mean wait time in U.S. EDs increased 25%, from 46.5 minutes to 58.1 minutes. Mean wait times were longer in EDs that went on ambulance diversion or boarded admitted patients in hallways and in...</td>
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<td>Hooker, R. S., &amp; McCaig, L. (1996).</td>
<td>To determine the percentage of the volume of patients managed by a PA or NP in the ED.</td>
<td>Retrospective data analysis of the National Ambulatory Medical Care Surveys (NHAMCS) 1992.</td>
<td>Hospital staff assigned to complete the survey instrument was instructed to record the types of providers seen at the visit. From this 1992 large survey database, the portion of ED visits in which the patient was seen by a PA and/or NP was selected and analyzed. These visits are referred to as PA/NP ED visits.</td>
<td>Reason for visit. Principal diagnosis.</td>
<td>An estimated 90 million ED visits occurred in the U.S. in 1992; PA/NP visits accounted for approximately 3.5 million or 4% of the total. Otitis media was the most frequently recorded diagnosis for PA/NP visits; the next three most frequent diagnoses for PA/NP visits involved wounds, sprains, and strains. Respiratory and abdominal disorders ranked among the top 10 diagnoses for both types of visits but were ranked higher for total ED visits.</td>
<td>It appears that PAs and NPs are being used in EDs widely, a fact that was not known before this study. However, the present extent of their use within the ED is small. The study analysis found few differences between ED visits at which the patient was seen by a PA/NP when compared to all ED visits.</td>
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<td>Hoot, N. R., &amp; Aronsky, D. A. (2008).</td>
<td>The objective of this review was to describe the scientific literature on ED crowding from the perspective of causes, effects, and solutions.</td>
<td>Systematic review of crowding in the ED.</td>
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<td>Three general themes existed among the causes of ED crowding: input factors, throughput factors, and output factors. Four general themes existed among the effects of ED crowding: adverse outcomes, reduced quality, impaired access, and provider losses. Three general themes existed among the solutions of ED crowding: increased resources, demand management, and operations research.</td>
<td>A total of 33 articles studied causes, 27 articles studied effects, and 40 articles studied solutions of ED crowding. Commonly studied causes of crowding included non-urgent visits, “frequent-flyer” patients, influenza season, inadequate staffing, inpatient boarding, and hospital bed shortages. Commonly studied effects of crowding included patient mortality, transport delays, treatment delays, ambulance diversion, patient elopement, and financial effect. Commonly studied solutions of crowding included additional personnel, observation units, hospital bed access, non-urgent referrals, ambulance diversion, destination control, crowding measures, and queuing theory.</td>
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<td>Horwitz, L., Green, J., &amp; Bradley, E. (2010).</td>
<td>Sought to characterize the variation in ED performance in wait times and visit lengths nationally, using data from 2006 National Hospital Ambulatory Medical Care Survey (NHAMCS).</td>
<td>Conducted a cross-sectional study of patient visits to 364 US EDs in 2006, using NHAMCS data.</td>
<td>Sample of visits to EDs of US general and short-stay hospitals, excluding federal, military, and Veterans Administration hospitals.</td>
<td>Examined median ED performance on wait time, defined as number of minutes between the time the patient arrived at the ED and the time the patient was treated by a provider, and length of visit, defined as the number of minutes between the time the patient arrived at the ED and the time the patient was discharged from the ED.</td>
<td>The median ED evaluated 78.3% of its patients within the triage target time (IQR 63.2% to 89.5%). Performance for acutely ill patients was lower. The median ED evaluated 66.9% of its acutely ill patients within the triage target time (IQR 52.0% to 81.9%). Although 80.3% of EDs evaluated at least half of their acutely ill patients within the triage target time, only 13.8% achieved this target for at least 90% of their patients.</td>
<td>Less than 1/5th of the EDs were able to treat at least 90% of their emergent or urgent patients (those triaged to be treated in an hour or less) within an hour; only half kept the ED visit &lt; 6 hours for at least 90% of their admitted patients.</td>
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<td>Johnson, M., Myers, S., Wineholt, J., Pollack, M. &amp;</td>
<td>To determine why patients LWBS, how long they perceived waiting versus</td>
<td>Prospective, scripted phone survey.</td>
<td>Conducted a prospective, scripted phone survey of all patients who left</td>
<td>Outcome measures were number leaving, ability to obtain care after</td>
<td>Mean time waited before leaving was 73.2 minutes while</td>
<td>Eighty-five percent of the LWBS group stated that they had a primary care physician. However, only</td>
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<td>Kusmiesz, A. (2009).</td>
<td>actual time waited before leaving, and factors that might have prevented LWBS.</td>
<td>without being seen over a 2-month period in 2006 at an ED with approximately 65,000 yearly visits.</td>
<td>leaving, reason for leaving, would they return to this ED, perceived and actual time waited, number with a primary physician, and factors associated with leaving.</td>
<td>the actual mean time waited was 70.4 minutes. The reasons for leaving were the length of wait (76.7%), the problem resolved (12.3%), and for other reasons (11.0%).</td>
<td>16.4% saw their primary care physician within 8 days of leaving the emergency department. After leaving the emergency department, 56.3% reported obtaining medical care within the 4- to 8-day time period. The majority (76.7%) of patients left because of the long wait. Almost half (43.8%) of the patients stated that they might have waited longer if provided with some “comfort measures,” such as analgesics, information, or initiation of diagnostic testing. These measures can be incorporated into the triage process and possibly reduce the LWBS number. Diagnostic testing in triage is becoming more common, using chief complaint-driven protocols.</td>
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<td>Jouriles, N., Simon, E., Griffin, P., Williams, C., &amp;</td>
<td>To measure the difference between publicly posted and actual ED wait times</td>
<td>The study was a retrospective consecutive sample.</td>
<td>This study was a retrospective consecutive sample of ED patients at the time of patient arrival were</td>
<td>Mean and standard deviation (SD) wait time</td>
<td>Publicly posted ED wait times show better accuracy in EDs that see 2,000 or fewer patients per month</td>
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<td>Haller, N. (2013).</td>
<td>and to compare these between ED site volumes.</td>
<td>one hospital system with 4 EDs. The wait times of 8,889 patients were included in this analysis. One ED was in a large teaching hospital with 5,000 ED patients per month; the other three were freestanding or community EDs without teaching and with fewer than 2,000 ED patients per month each.</td>
<td>recorded and compared to the actual wait times as retrieved from the ED tracking system.</td>
<td>difference at the main ED with a volume of 5,000 patients per month was 31.5 (±61.2) minutes. At the facilities with fewer than 2,000 ED patients per month each, the differences in wait times were 4.2 (±21.8), 8.6 (±23.8), and 1.3 (±11.9) minutes. ANOVA results revealed that the main ED had significantly different actual wait time and wait time differences (p &lt; 0.05) when compared to the other three EDs.</td>
<td>and less accuracy for an ED that sees 5,000 patients per month.</td>
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<td>Kulis, P., Gunther, A., &amp; Nestor, S. (2011).</td>
<td>Air Force Medical Operation Agency (AFMOA) partnered with the ED staff to develop a process improvement (PI)</td>
<td>Existing triage, patient check-in, and leadership office space was converted into a new triage area with an accompanying Fast United States Air Force (USAF) Hospital Langley Emergency Department.</td>
<td>ED Door to physician wait times, Door to admission times, and Left without Being Seen</td>
<td>Within 6 months, the ED saw decreases in “door to door,” “door to floor,” “door to doc,” Incorporating a dedicated fast track only slightly decreased the non-urgent “door to door” time by five minutes (approximately 0.5%) but indirectly</td>
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<td>Niska R., Bhuiya, F., &amp; Xu J. (2010).</td>
<td>Study presents data on U.S. ED visits in 2007, with statistics on hospital, patient, and visit</td>
<td>Data are from the 2007 NHAMCS, a national probability sample survey of nonfederal, general,</td>
<td>Data are from the 2007 National Hospital Ambulatory Medical Care Survey, which</td>
<td>Emergency department utilization, Reasons for visits, primary diagnoses,</td>
<td>Patients saw physicians at 89.7%, physician assistants at 9.2%, and nurse</td>
<td>The leading reasons for visits among children (under age 15 years) were fever, cough, and vomiting.</td>
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<td>Pines, J. M., Mullins, P. M., Cooper, J. K., Feng, L. B. &amp; Roth, K. E. (2013).</td>
<td>To describe trends in use of emergency departments of older adults, reasons for visits, resource use, and quality of care.</td>
<td>Retrospective data were used from the 2001-2009 National Hospital Ambulatory Medical Care Survey.</td>
<td>The 2001-2009 NHAMCS dataset includes information from 322,745 ED encounters representing 1.05 billion ED visits. The sample was then restricted to older adults (&gt; 65), and the number of individuals was tabulated according to demographic characteristics (race and ethnicity, sex), payment source, disposition, and Top 10 reasons for visit, resources used, wait time, length of stay, and LWBS.</td>
<td>health care providers, hospital admissions.</td>
<td>practitioners at 4.0% of ED visits. In 2007, there were 116.8 million ED visits or 39.4 visits per 100 persons. There were about 222 visits to U.S. EDs every minute during 2007.</td>
<td>The leading reasons given by patients aged 15-64 years for visiting the ED were chest pain and abdominal pain. The leading reasons given by older patients (aged 65 years or over) for visiting the ED were chest pain, shortness of breath, and abdominal pain.</td>
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<td>Rowe, B., Channan, P., Bullard, M., Blitz, S., Saunders, L., Rosychuk, R., . , Holroyd, B. (2006).</td>
<td>Purpose of this study was to determine the acuity level, reasons, and outcomes of LWBS cases.</td>
<td>This was a prospective study of a convenience sample of LWBS cases, chosen during seven 7-day periods from May to August 2002 and four similar periods from May to July 2003.</td>
<td>The study took place at the University of Alberta Hospital and Stollery Children’s Hospital EDs in Edmonton, Alberta, Canada.</td>
<td>Wait times, triage levels, Reasons for LWBS, outcomes of LWBS.</td>
<td>Dramatic growth in the proportion of encounters with a physician assistant, which from 2001 to 2009 increased from 5.1% to 6.9%, and a nurse practitioner, which increased from 1.0% to 3.1% over the study period.</td>
<td>Of the 498 LWBS patients contacted, 282 (57.6%) felt much better, 78 (15.9%) reported their symptoms were unchanged, and only 21 (4.3%) felt a “little” or “much” worse. Overall, 300 (60%) subsequently sought medical attention for the acute symptoms they had presented to the ED.</td>
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Hospital-level variables (geographic location, profit status, urban vs non-urban).
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<tr>
<td>Shea, S., &amp; Hoyt, K. (2012)</td>
<td>To describe the implementation of a rapid team triage model that was instituted at an urban community hospital with a Level II trauma center designation in Los Angeles County.</td>
<td>The team included an NP or PA, two nurses (including the previous nurse assigned to the waiting room triage station), an ED technician, the registrar, and a dedicated volunteer greeter. From 10 a.m. to 10 p.m., patients were greeted at the door and escorted directly to the next available fast track bed. Only enough information was collected to enter the patient into the computerized tracking</td>
<td>Urban community hospital with a Level II trauma center designation in Los Angeles County.</td>
<td>LWBS, patient throughput, patient satisfaction.</td>
<td>Rate of LWBS fell from a high of 4.4% to a post-implementation level of 1.44% whereas patient throughput decreased from 187 to 127 min. Although one of the primary goals was to have patients more satisfied by having them seen by a provider upon arrival, our overall patient satisfaction</td>
<td>The current traditional “nurse triage” model of managing patient arrival is a barrier to the process of getting patients efficiently to such a provider. To function efficiently, EDs can benefit from the immediate assessment and disposition of patients with less acute problems, thereby decompressing the main department. An NP- or PA-directed rapid triage team is a successful and innovative approach, making patients the focus and driver of their ED experience.</td>
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<td>system. The patient, if able, completed a quick registration form, which included name, stated complaint, date of birth, social security number, and allergies. Any available member of the team then initiated an abbreviated intake form focused on chief complaint and vital signs. The actual MSE was performed by the assigned “RAPID” NP/PA or MD.</td>
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<td>ratings rose only a few percentage points.</td>
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