2021

The Impact of Inpatient Boarding in North Carolina Emergency Departments

Miracle Howard
Walden University

Walden University

College of Health Professions

This is to certify that the doctoral study by

Miracle Howard

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Sally Willis, Committee Chairperson, Health Sciences Faculty
Dr. Rabeh Hijazi, Committee Member, Health Sciences Faculty
Dr. Suzanne Richins, University Reviewer, Health Sciences Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2021

Abstract

The Impact of Inpatient Boarding in North Carolina Emergency Departments

by

Miracle Howard

MA/MS, Ashford University, 2017

BS, Queens University, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

November 2021

Abstract

Currently, emergency department overcrowding has negatively impacted hospitals' financial, operational, and organizational performance globally. A contributing factor to emergency department overcrowding includes the delay of the throughput process for patients who have a time-sensitive diagnosis and are admitted to the emergency department. This causes adverse hospital outcomes such as longer length of stays and increase hospitalization cost. This study utilized secondary data to address a relationship between admitted patients who have time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay, utilization of services, and overall hospital cost. The conceptual framework for this study is the Donabedian model, which evaluates a hospital's structure, process, and outcome to improve the quality of care. The sample size for this quantitative study included a total of 17,328 patients admitted within North Carolina Emergency Departments with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease in 2017. The statistical analysis used for this study was a univariate regression and ANOVA model. The results from this study indicated there was a significant relationship among admitted patients within emergency departments of North Carolina with time-sensitive diagnosis and length of stay, utilization of services cost, and overall hospital cost. This study will assist in improving hospital outcomes by addressing influential factors of emergency department crowding, which will promote optimal health, decrease utilization of services and length of stay while reducing emergency crowding leading to positive social change.

The Impact of Inpatient Boarding in North Carolina Emergency Departments

by

Miracle Howard

MA/MS, Ashford University, 2017

BS, Queens University, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

November 2021

Dedication

I want to dedicate this dissertation to my beloved students of Whitney M. Young Job Corps Center. Despite the adversities and stumbling blocks that came along during this journey, you guys were my motivation. Each day in the classroom seeing the eyes of willingness to learn, the hands raised eager to attain, and the puzzled faces when classes were over was the light in my darkest tunnel.

This dissertation is proof that it can happen; with faith, perseverance, and willpower, all things are possible. I want to encourage you all to aim for the stars and always strive for more. If it were not for you guys creating so many beautiful memories during this process, I would not know where and when it would have ended. I thank you for each encounter and every experience.

Acknowledgments

This work would not be possible without the unconditional love and support of many people. I want to thank my mother, Robin Rucker, for constantly reminding me to put God first in everything I do. I want to thank my amazing aunt DeAndrea Howard McKinney for always believing in me and continuously pushing me forward through this entire journey. Thank you for always being a call and a hug away. I would also like to thank my spiritual godmother Milvenia Bridgewater. Mama Mel, ' thank you for your unconditional love and continuous prayers. Thank you for lifting my chin by showering me with encouragement. I would like to also thank Dr. Stephanie Barber for being an exceptional, aspiring, and most importantly, compassionate leader. While working full-time and completing this journey, your leadership, compassion, and guidance assisted me in completing this dissertation. I am forever grateful for having your presence in my life. I would like to also acknowledge and thank Dr.Julie T. Ellis for your unwavering support and encouragement. Finally, I would like to thank my chairman Dr. Sally Willis for your continuous guidance and mentorship through this entire process.

Table of Contents

List of Tables

Section 1: Foundation of the Study and Literature Review

Introduction

Recent studies have indicated that emergency department crowding has caused a detrimental impact on hospitals worldwide (De Boeck et al., 2019). The Institute of Medicine's "Hospital-Based Emergency Care Breaking Point" brought national attention to emergency department overcrowding after statistics showed a 26% increase in emergency visits. At the same time, the number of emergency departments decreased by 400, and the number of readily available patient beds decreased by 200,000 (McCoy et al., 2015). Although researchers have recently recognized emergency department overcrowding as an issue, few have focused on the throughput process and the negative impact of emergency crowding among patients who require time-sensitive care and procedures. Emergency crowding can negatively impact patients who need time-sensitive care due to their sensitivity to diagnosis.

Prolonged emergency department wait times of admitted patients can increase patients' risk of leaving without being seen, more extended hospital stays, and higher mortality rates (Carmen et al., 2017). Morley et al. (2018) noted that overcrowding in the emergency department could occur due to delays in assessing and treating admitted patients. The lack of untreated time-sensitive care significantly increases hospital costs and utilization of service. Schreyer and Martin (2017) noted personnel costs per patient bed-hour were $58.20 for the emergency department, $24.80 for an inpatient floor, $19.20 for the inpatient observation unit, and $10.40 for an admission holding area. The congestion of admitted patients housed in the emergency department has contributed to the significant increase in overcrowding and hospital costs (McKenna et al., 2018).

In a recent study, Zodda and Underwood (2019) found that mortality increased with emergency department boarding time, 2.5% of patients boarded less than 2 hours to the correlation of 4.5% of patients boarded 12 hours or more. The researchers also found that the average hospital length of stay for male patients has increased, from 6 days for those who boarded for less than 2 hours to 8 days to those who boarded 12 hours or more (Zodda and Underwood, 2019). Emergency crowding with associated delays in inpatient care of critically ill patients is a problem faced by emergency departments in the United States (McKenna et al., 2018). According to the Joint Commission, the standard amount of time patients wait for an inpatient bed within crowded emergency departments is almost three hours more than those not constricted by crowding (Schreyer and Martin, 2017).

Emergency department crowding is a universal concern, often occurring when emergency department function is impeded because of the excessive number of patients waiting to be seen, assessed, and treated (Yarmohammadin et al., 2017). Turk (2014) noted that emergency department overcrowding is a substantial public health problem due to deprivation of the quality of care, such as prolonged waiting times, delays to diagnosis and treatment, delays in treating seriously ill patients, increased costs due to unnecessary diagnostic investigations, and patients' dissatisfaction. Prolonged wait times cause a disruption in the throughput process within the emergency department.

Saad Al-Qahtani et al. (2017) recognized emergency department overcrowding is due to the unavailability of acute beds in specialized units based on the results of their study, which examine the impact of boarding in the emergency department and the outcome of patients admitted to the intensive care unit (ICU). In this study I found that boarding in the emergency department is associated with higher mortality. Although emergency overcrowding has raised

attention worldwide, only a few studies have explored the relationship between delayed admissions and outcomes (Saad Al-Qahtani et al., 2017).

The results of this study may provide awareness of the significance of improving the throughput process for healthier outcomes of patients who require expedite care for time-sensitive diagnoses admitted to the emergency department. This study may positively impact social change by minimizing short and long-term hospitalization while reducing emergency room visits, maintaining a productive workforce with healthier populations.

Problem Statement

Between 2000 and 2014, the number of annual emergency department visits in the United States rose to 33 million, while the number of emergency department operations fell by 242 (Woodworth, 2020). With this significant increase of visits, readily available resources are limited, especially those who require time-sensitive care and or time-sensitive procedures. The problem challenge is to address the impact of the throughput process and its influential factors on time-sensitive procedures for patients admitted within North Carolina emergency departments related to emergency crowding globally.

According to the Cecil G. Sheps Center for Health Services Research (2020), some of the most frequent time-sensitive diagnoses provided within North Carolina emergency departments were patients who had undergone chest pain and chronic obstructive pulmonary disease. These diagnoses require time-sensitive care and expedited services to prevent a detrimental decline in patient health status, more extended hospitalization stays, and cost.

De Boeck et al. (2019) noted that crowding occurs when the demand for emergency department resources does not meet the available resources in the emergency department. Throughput process can be defined as the amount of time a patient undergoes triage within the

emergency department until a patient is discharged and admitted within the hospital (Shiloh, 2015). With the lack of readily available resources, hospital utilization of services has created emergency department access to an upsurge, creating overcrowded emergency departments (Nickpay et al., 2017). To ensure the demand for resources meets the needs of patients, the exploration of the throughput process is vital. The emergency department throughput process is the foundation of the emergency department's structure and patient outcomes. Carmen et al. (2017) showed critically ill patients' throughput processes often consist of longer duration times in the emergency department due to the emergency department throughput process.

Measuring the throughput process, determined by the length of stay of patients admitted into the emergency department, may help understand the causes of overcrowding in the emergency department. The results of patient outcomes are measured by examining the length of stay, utilization of services of time-sensitive care, and overall hospital charges of patients admitted within the emergency department (The Agency of Research and Quality, 2016).

The gap of this study will help address the limited information on the influence of emergency department overcrowding on admitted patients within the emergency department who requires time-sensitive care as it relates to hospital outcomes. The impact of delayed hospital admission due to prolonged emergency room wait times can cause a detrimental effect on hospital financial, operational, and patient outcomes (McKenna et al., 2018). The study of factors contributing to emergency department overcrowding and adverse outcomes is an unremitting goal for hospitals worldwide (Sund et al., 2015).

Purpose of the Study

Emergency department crowding has been a global issue throughout the world. Emergency department throughput is a function of patient volume and acuity entering (input),

length of stay (throughput), and disposition (output) (Zodda and Underwood, 2019). The Institute of Medicine (2014) recognized the delayed emergency department throughput process as a significant impediment to appropriate patient care and call for a measure to improve the throughput process in the emergency department (Siletz et al., 2017). The purpose of this quantitative study was to explore secondary data to establish correlations between patients with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease admitted to North Carolina emergency departments and their length of stay, utilization of services cost, and hospital charges. This will assist North Carolina emergency departments to better understand causes of overcrowding of local emergency departments.

The Cecil G. Sheps Center for Health Services Research (2017) studied the most frequent utilization of services, hospital cost, length of stay, and patients admitted within North Carolina emergency departments. Results indicated that time-sensitive diagnosed patients with chest pain or COPD were the most frequently impacted by services after admissions within the emergency department. The independent variables for this study are patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments. The dependent variables of this study are the length of stay, utilization of services cost, and total hospital charges. The covariates for this study are age and calendar year.

Research Questions and Hypothesis

Research Question 1: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017?

$H_0$1 (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017.

H_a1 (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017.

Research Question 2: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017?

$H_0$2 (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017.

H_a2 (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017.

Research Question 3: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization cost among North Carolina hospitals in 2017?

$H_0$3 (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization costs among North Carolina hospitals in 2017.

H_a3 (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization costs among North Carolina hospitals in 2017.

Theoretical Foundation

Emergency crowding is due to the factors that contribute to the throughput process of emergency departments. To help explore the underlying factors that contribute to the throughput process, it is imperative to examine the structure of the emergency department. The conceptual framework used for this study to investigate the impact of inboarding patients in North Carolina emergency departments with time sensitive diagnosis and length of stay, utilization of services and hospitalization cost is the Donabedian model (Donabedian, 1966). Sund et al. (2015) noted that the Donabedian model is a framework to examine and evaluate the quality of healthcare and health services. The model uses evidence from three classifications to define the quality of care: structure, process, and outcome. The structure component is the process in which is how care is delivered. The composition may include but is not limited to the hospital facility and readily available resources such as hospital beds and staffing.

The process component is the relations between patients and providers throughout the delivery of healthcare. The outcome is the concluding result that impacts the overall patient healthcare and or health status of the target population (Sund et al., 2015). This model will be used to explore the utilization of services for admitted patients with time-sensitive diagnoses such as chest pain and COPD within the emergency department, throughput process, and overall hospitalization cost.

McKenna et al. (2018), noted that emergency departments overcrowding could result from poor design of the emergency department and prolonged throughput due to staffing ancillary service performance, and flow processes. This framework aims to identify the influences that impact the structure that causes the outcomes, known as "structure-process-outcome." According to the Donabedian health care quality model, improvements in the formation of care could improve clinical processes that should, in turn, improve patient outcomes (Moore et al., 2015).

The Donabedian model can help explore the factors contributing to the throughput process of patients admitted within North Carolina Emergency Departments with time-sensitive diagnoses such as chest pain and COPD. The exploration of North Carolina's onboarding patients: length of stay, hospital utilization, patient outcomes related to the throughput process, which the usage of this model will measure. The Donabedian model may also help create an innovative structure to reduce emergency department overcrowding while promoting patient and hospital operational and financial outcomes.

Nature of Study

The nature of this study will be quantitative data analysis with a cross-sectional correlational design related to the impact of the duration of the throughput process of patients who have a time-sensitive diagnosis with North Carolina emergency departments. Data showing patients' diagnosis, length of stay, and utilization of services, hospital cost, and mortality rates of patients in North Carolina emergency departments were examined. A regression analysis was used to predict the relationship between the independent variable of admitted patients in the emergency department who have a time-sensitive diagnosis (chest pain and COPD) and dependent variables: (length of stay, utilization of services cost, and overall hospital charges)

while controlling for covariates such as age, calendar year, and geographical location. A univariate analysis was used to establish the relationship between the independent and dependent variables. The findings of this study may reduce the gap in the literature on the underlying factors contributing to emergency department crowding, such as the throughput process of admitted patients. They require time-sensitive care base on their diagnosis within the emergency department.

Literature Review and Strategy

The Walden University Library online database was utilized to help find peer-reviewed articles and journals for this research study. The databases used for this study were the Agency of Research and Quality, Cinahal and Medline, ProQuest Health and Medical, Medline, PubMed, and Healthcare Cost and Utilization Project. A univariate regression model was provided by SPSS statistical software to establish the relationship among the variables.

The measurement of the independent variable of patients admitted with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments will help determine whether there is a significant relationship with the duration of admitted patients requiring time-sensitive care within the emergency department and emergency department overcrowding. The examination of the independent variables (utilization of services, length of stay, and hospital cost) will determine whether there is an association with the throughput process and if it has a significant impact on factors of emergency department crowding. The terms and keywords used (e.g., throughput process, emergency department crowding, length of stay, and time-sensitive care) were acquired from these results from each of the databases used to research this study. The search was limited to peer-reviewed, scholarly journals and articles published between 2015 and 2019.

Literature Review

The purpose of this literature review is to highlight historical and recent studies supporting the need to address how the throughput process of patients requiring time-sensitive care admitted within the emergency department contributes to emergency department overcrowding and affects hospital outcomes. This study aims to bridge the gap in the literature through an array of empirical studies focusing on the impact of the throughput process of admitted patients within North Carolina emergency departments that require time-sensitive care.

The findings of this study will help determine how the emergency department throughput process of the admitted patient who requires time-sensitive care impacts hospital outcomes. Several previous studies explored the contributing factors of the emergency department throughput process of boarded patients who require time-sensitive care.

Emergency Department Crowding

Emergency department crowding is one of the most notorious issues within hospital emergency departments today. Emergency department crowding became a recognized concern after the United States Congress established Medicaid and Medicare in 1966 by 1975; reports indicated over 7,156 hospitals and 1.5 million beds in the United States (Zodda and Underwood, 2019). Since the expansion of Medicaid and Medicare, more than 1,000 hospitals within the United States have closed. At the same time, the number of inpatient beds has decreased by one-third, and emergency visits increased by seventy percent (Zodda and Underwood, 2019).

Crowding often occurs when patients with time-sensitive diagnoses such as chest pain and upper acute respiratory infections must remain in the emergency room after being admitted to the hospital due to poor synchronization within the emergency department and hospital. These patients are recognized and defined as "inpatient boarding" (Carmen et al., 2017). Inpatient

boarding is one of the main contributors to crowding, causing severe consequences. As mentioned, prior, inpatient boarding is admitted patients within the emergency department who cannot transfer to their appropriate unit. It must remain in the emergency department until its readily available unit (De Boeck et al., 2019).

The duration of critically ill patients can negatively impact patient outcomes, hospital costs, and utilization. According to Saad Al-Qahtani et al. (2017), critical patients are held within the emergency department due to the lack of essential beds available. The authors also noted that patients who require time-sensitive care must wait two hours to a few days, leading to delay in time-sensitive interventions. The results of their study indicated the duration of boarding due to the unavailability of intensive care beds available that occurred in78% of the admission patients within the emergency department (Saad Al-Qahtani et al., 2017). The consequences associated with these patients leaving without being seen, poorer patient outcomes and higher mortality rates (Carmen et al., 2017).

Impact of Delay Throughput Process

Many factors contribute to emergency department crowding. As mentioned, there are three components of the Donabedian model exploring emergency department crowding: structure, process, and output (Zodda and Underwood, 2019). The structure component consists of any event or system contributing to the demand for emergent services, such as time-sensitive procedures (Mentzoni et al., 2019). The next component is the throughput process, one of the leading causes of emergency department crowding (Mentzoni et al., 2019).

The throughput process begins when a patient is triaged until they are allocated to their appropriate unit and discharged. The throughput process has also been associated with increased hospital costs. DeBoeck et al. (2019), explored the impact of critically "needy" patients within

the emergency departments. Prior studies indicated that critically ill patients housed in the emergency department also cause hospital charges to increase and financial performance to decrease. Boarding patients within the emergency department requires more services due to the extended duration of holding in the emergency department (De Boeck et al., 2019). This increase in services also increases hospital charges and declines hospital overall financial performance. The throughput process can have a detrimental impact on hospital and patient outcomes. One of the essential variables the throughput process impacts is the length of stay (Zodda and Underwood, 2019). Length of stay for patients has been associated with delays in time-sensitive care, poorer patient outcomes, and decreased patient satisfaction (Mentzoni et al., 2019). The contributing factors and impact of longer lengths of stay will be further discussed in the next section.

Time Sensitive Care

As the population expands within the emergency department, so does the demand for time-sensitive care patients within the emergency department. The emergency department is designed to deliver time-sensitive interventions for critical illnesses such as cardiovascular disease, respiratory distress, stroke, septic, myocardial infarction, and traumas (Gaieski et al., 2017). These critical illnesses require time-sensitive care and services such as intravenous fluids, respiratory intubation, and emergent surgeries such as upper gastrointestinal endoscopy. Several studies indicated emergency department crowding has a detrimental impact on patient outcomes based on those who required time-sensitive care, such as longer length of stays, increased utilization services, hospital cost, and mortality rates (De Boeck et al., 2019).

Gaieski et al. (2017) conducted a cohort study of severe septic patients who required time-sensitive care. The variables measured in this study were occupancy, waiting for patients,

admitted patients, and patient hours. Two thousand nine hundred thirteen severe sepsis patients were admitted to the hospital during the study period, and 1127 qualified for protocolized care. In-hospital mortality was 14.3% overall and 26% for patients qualifying for protocolized care. According to Gaieski et al. (2017), boarding patients were housed in the emergency department for several hours due to the unavailability of hospital beds.

Results indicated that patients requiring time-sensitive care had delayed intravenous fluid and antibiotics for severe sepsis patients as emergency department crowding increases, contributing to the increased hospital mortality rate. Time-sensitive interventions will reduce the length of stay and improve patient outcomes.

Length of Stay

Emergency crowding causes a delay in treatments and services for patients who are critically ill within the emergency department. The postponement of procedures and services for boarding patients in the emergency department increases patient's hospital length of stay (Mckenna et al., 2018).

The total hospital length of stay is the total time a patient has been admitted until discharge. Emergency department boarding has been determined to increase full hospital length of stay by at least one day, with the longest borders having an increased length of stay of three days (McKenna et al., 2018).

According to Mckenna et al. (2018), prior studies indicated an association with specific subsets of patients and increased length of stays. Patients whose length of stay was more than four hours in the emergency department were older than 65 years, requiring time-sensitive care such as undergoing surgical interventions, neurology or internal medicine patients, patients needing radiology or laboratory testing, and critically ill patients. Overall results from the study

indicated that an array of subsets' length of stay is impacted, contributing to emergency crowding.

Montgomery et al. (2014) conducted a retrospective study analyzing the boarding time of transferring critically ill patients housed within Canadian emergency departments to the intensive care unit. The study results indicated 122 sick critically median boarding time was 34 min or less, possibly indicative of quality care and predictive of positive outcomes for these individuals (Montgomery et al., 2014). The success of boarding critically ill patients was due to the Canadian Acuity Tracking System (CATS). The authors also noted, critically ill patients housed in the emergency departments are the sickest and require assessment, diagnosis, treatment, and expedient transfer out of the emergency department to reduce the length of stay.

Definition of Terms

Below is a list of terms that will be utilized throughout this study.

Chronic obstructive pulmonary disease: A chronic inflammatory lung disease that causes obstructed airflow from the lungs (Mayo Clinic, 2020).

Emergency department crowding: A commonly used term to describe the condition in which the emergency department function is obstructed primarily because of the excessive number of patients waiting to be seen, undergoing assessment and treatment, or waiting for departure comparing to the physical or staffing capacity of the emergency department (Yarmohammadian et al., 2017).

Exacerbation: Chronic symptoms that worsen for days or weeks (Mayo Clinic, 2020).

Hospitalization cost: According to the Agency of Research and Quality (2016), hospitalization cost is the charge of the procedure performed.

Inpatient boarding: This term refers to admitted patients within the emergency department who cannot transfer to their appropriate unit and must remain in the emergency department until their readily unit is available (De Boeck et al., 2019).

Length of stay: Is a term in which refers to the amount of time a patient is held within a hospital setting (Siletz et al.,2017).

Mortality rate: The percentage of patients admitted within the emergency department who died while in hospital care (Agency of Research and Quality, 2016).

Throughput: A common term used to measure the duration of a patient's initial sign-in to the emergency department until the patient is discharged to the appropriate unit (A New Process to Improve Throughput in the Emergency Department, 2019).

Time-sensitive care: Care requires to expedite services to ensure the most optimal procedure and performance (Siletz et al.,2017).

Assumptions

This study was reliant on identifying the relationship between emergency department crowding and admitted patients within the emergency departments of North Carolina. They require a time-sensitive care throughput process as it relates to hospital outcomes. The exploitation of data was derived from the Agency of Research and Quality Database for the state of North Carolina hospital. The length of stay was compared to the utilization of services, hospital cost, and mortality rate. The covariates such as age and calendar year were further examined to seek a relationship.

According to the Agency of Research and Quality (2016), the Z-test calculator allows you to test the significance of the difference between two weighted counts, means, or percentages. A Z test calculator will be used to help measure the standard of errors to help

determine whether a statistical relationship exists among the length of stay, utilization of services, mortality rate, and hospital cost.

Scope and Delimitations

While exploring the data for this study, there may be a few delimitations in which may arise. A limitation that may occur while conducting this study is using information from the Cecil Sheps Center for Health and Research emergency discharge data from 2017. The data exploring emergency departments will be updated in October 2021. Emergency departments in North Carolina may have various challenges that developed, leading to limitations on updated information. Another limitation is the amount of patient data released by the Cecil Sheps Center for Health and Research due to Protected Health Information (PHI). The lack of information includes social determinants and socioeconomic statuses such as location, work, age, education, physical environment, and access to care. The lack of variables can prevent finding correlations amongst the variables and will require different relationships.

This study will seek to explore the impact of contributing factors to emergency department crowding have on hospital services and outcomes among North Carolina hospitals. This study will utilize secondary data provided by The Cecil G. Sheps Center for Health Services Research and Health Services data retrieved from hospitals within North Carolina. The most recent data analyzed will be from 2017. The purpose of this study is to correlate a relationship among the length of stay, utilization of services, hospital charges for time-sensitive care diagnosed admitted within the emergency department while controlling for covariates such as sex and geographical locations.

This study proposal should provide the implications in determining the underlying factor contributing to emergency department overcrowding, known as the throughput process. This

study will provide evidence that supports the impact the throughout process has on patients who require time-sensitive care within the emergency department. There are vital definitions of keywords used throughout this study to help support this study. The nature of this study and research question are two sections developed to help clarify and define this study. The upcoming sections will include the literature review and further analysis to support the need for new research on the impact of the throughput process of emergency department crowding and explain the gap from previous supporting literature.

Significance of the Study

The recognition of influences that contributes to patient outcomes is a goal for all healthcare administrators. This study may create innovative ways to help reduce the significant increase of emergency department overcrowding. For instance, secondary data could provide evidence that supports the impact of contributing factors that adversely affect patient outcomes due to the delayed admission process in the emergency department. The findings of this study may help reduce the high hospitalization cost and improve patient outcomes of critically ill patients.

The significance of this study on healthcare administration is the impact of the throughput process of admitted patients within the emergency department on hospital outcomes and hospital costs.

This exploration of the influence of the throughput process on emergency department crowding can help healthcare administrators develop strategies with an essential role in improving patient flow, delay in services, and overcrowding of the emergency departments (Yarmohammadian et al., 2017). Reducing hospitalization costs will help improve operational and financial outcomes by increasing adequate resources within emergency departments.

Summary

Emergency department crowding is a worldwide concern associated with admitted patients who have a time-sensitive diagnosis and demand care within a timely manner. Prior research indicated length of stay, lack of time-sensitive care, and the impact of delay throughput process had significantly contributed to emergency department crowding. The literature presented in section one provided considerable evidence on the need to alleviate emergency crowding and how it causes a detrimental impact on hospital outcomes.

The following section will discuss the methodology and data collection of this study. This section will discuss the research design utilize to explore the relationship of patients who have a time-sensitive diagnosis such as chest pain or chronic obstructive pulmonary disease admitted within the emergency departments of North Carolina. Section 2 will also further analyze and compare the length of stay, utilization of services, and hospital charges. The North Carolina Emergency Department Discharge data will carefully examine and analyzed, with permission from The Cecil G. Sheps Center for Health Services Research. As mentioned in section one, a multiple regression will help explore the relationship between the length of stay, utilization of services, hospital charges, and mortality rate. The results of this study may help identify factors contributing to emergency crowding and innovative ways to alleviate this global issue to improve hospital outcomes.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study is to examine the underlying contributing cause of emergency crowding by exploring the impact of the throughput process for time-sensitive care. The data provided may show patients who have time-sensitive diagnoses such as chest pain and or chronic obstructive pulmonary disease admitted within North Carolina emergency departments related to their hospital charges, utilization of services, and length of stay. The data may also provide demographics such as the age of admitted patients and geographical location. The independent variable of this study is the patients who have time-sensitive diagnoses such as chest pain and or chronic obstructive pulmonary disease. The dependent variable of this study is the length of stay, utilization of services, and hospital charges. The length of stays, hospital charges, and usage of services will be further analyzed to explore whether there is a statistical relationship. The throughput process will be measured by the length of stay of patients admitted within the emergency department. This section will include the research methodology, setting and sample, size, region, and target population.

Research Design and Rationale

This study consists of a secondary quantitative methodology utilizing a multiple linear regression model. The univariate model was used to analyze the research questions independent variable of admitted patients within the emergency departments of North Carolina. They have a time-sensitive diagnosis related to a patient's length of stay, hospitalization cost, and mortality rates. The univariate and ANOVA model may similarly determine whether there is a statistical or nonstatistical relationship with the extent of visit, time-sensitive diagnosis, utilization of services, and hospitalization charges of admitted patients within North Carolina emergency departments.

The research design will explore relevant results for patient's length of stay, utilization of services cost, and overall hospitalization cost to ensure a positive social change with the throughput process of emergency departments within the targeted population. G*Power was used to compute the throughput impact and display the power analyses' results graphically. Statistical Package for the Social Science (SPSS) was also used to simplify corporate complex data presented within this study. The univariate and ANOVA model was used in this study to assist in determining the relationship of patients who were admitted with time-sensitive diagnoses within the North Carolina emergency department and their length of stay related to hospital outcomes. It may also assist in quantifying data from admitted patients while measuring multiple characteristics within the sample while potentially exploring additional discoveries. The quantitative research data within this study was utilized to find the impact of the throughput process of admitted patients who require time-sensitive care within North Carolina emergency departments in 2017.

Methodology

According to the Cecil G. Sheps for Health Services Research (2020), there are a total of 109 hospitals in the state of North Carolina in which act as short-term, acute, and non-federal hospitals. As of 2017, there were approximately 4,373,661 emergency department visits within North Carolina hospitals. Of those visits, 54.9 % were Caucasian, 35.6 % were African American, 1.1% were American Indian, 0.7% were Pacific Islander, 6.4 % were another race, and 1.3% were unavailable. There were 1,026,525 emergency department visits among patients who were between the ages of 45-64 years. There were 549,189 emergency department visits among patients who were age between 65-84. There were 115,268 emergency visits among patients who were 84 and older. The research does not exclude geographical location, age, race,

gender, and calendar year but preferably utilizes the covariates (age, calendar year, geographical location) to explore additional factors that determine the relationship with the throughput process and hospital outcomes.

Setting and Sampling Procedures

The Healthcare Cost and Utilization Project collaborates with healthcare databases and related software tools and products developed and sponsored by The Cecil G. Sheps Center for Health Services Research (2020). Data acquired will be analyzed that consist of patients admitted within the 109 North Carolina Emergency Departments who required time-sensitive care for two of the most common sensitive diagnosis. The data entails specific procedure codes of patients diagnosed with chest pain and or chronic obstructive pulmonary disease in which will be further analyzed with the length of stay, utilization of services, and overall hospitalization cost.

In aggregation with the secondary data set supplied by The Cecil G. Sheps Center for Health Services Research (2020), this research will focus on patients admitted within the 109 North Carolina emergency departments over the age of 40. A sampling calculator provided by *calculator.net* was used to determine the sample size for patients who required time-sensitive care such as chest pain or chronic obstructive pulmonary disease admitted to North Carolina emergency departments in 2017. According to The Cecil G. Sheps Center for Health Services Research (2020), there were 15,393 diagnosed with chest pain and 2,459 diagnosed with the chronic obstructive pulmonary disease within North Carolina Emergency Departments. The utilization of G*Power Version 3.1.9.4 determined power analysis. The analysis calculations revealed that 163 patients are needed to have a confidence level of 80% that the real value is within ±5% of the measured patients diagnosed with chest pain and chronic obstructive pulmonary disease. The data provided from the Healthcare Utilization Project (HCUP) is

publicly available, and further analysis required permission from the Cecil G. Sheps Center for Health Services Research. This study consists of secondary data that was pre-collected. Therefore, no human participants were necessary—an application for retrieval of the North Carolina Emergency Department Discharge data request form was required. Ethical precautions were taken, ensuring that data utilized was from the Agency of Research and Quality Healthcare Utilization Project.

Data Collection

The data collected for this study is from the North Carolina Hospital Discharge Data provided by Cecil G. Sheps Center for Health Services Research for 2017. The purpose of utilizing this secondary set for this study is to compare specific time-sensitive diagnoses on all admission within North Carolina emergency departments and their length of stay, utilization of services, and hospital charges in 2017. The data collected will further explore any relationships with the sensitive diagnosis and range of stay, utilization of services, and hospital charges. SPSS was used to conduct the linear and multiple regression analysis. After the calculations for the linear regression were performed, the results were further analyzed to explore the relationships of variables and determine whether to reject the null hypothesis.

Instrumentation and Operationalization of Constructs

The Cecil G. Sheps Center for Health Services Research Organization (2020) obtained data for this study. The hospital data retrieved was from all North Carolina Hospitals in 2017. The data gathered will consist of all patients admitted within the North Carolina emergency department related to their length of stay, diagnosis, utilization of services, and hospital charges. This data may help explore the relationship between the hospital throughput process of time-sensitive care patients. A data use agreement was required to use the North Carolina Discharge

Database to protect patient information and prevent unauthorized usage of healthcare information. The Cecil G. Sheps Center for Health Services Research is under contract with the Division of Health Service Regulation for research, health planning N.C. Hospital Discharge Data collected by Truven Health Analytics (The Cecil G. Sheps Center for Health Services Research, 2020). There are yearly updates from Truven in which keep data readily current. The data from this study is not available to the public but is available for research.

Operationalization

Among the three research questions, the independent variable is time-sensitive, diagnoses such as patients diagnosed with chest pain or chronic obstructive pulmonary disease, and three dependent variables that influence emergency crowding and the throughput process of emergency departments. The first research question asks: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017? Time-sensitive diagnosis is a nominal variable and operationalized as chest pain or chronic obstructive pulmonary disease. The dependent variable length of stay was operationalized as a numeric value of 0-20 days.

The second research question asks whether there is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017. Time-sensitive diagnosis is the independent variable, and the usage of services is the dependent variable. The usage of services includes the following: surgery charges, lab and blood charges, pharmacy charges, radiology charges, respiratory charges, therapy charges, supplies charges, and other charges.

The third research question asks whether there is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and overall hospitalization cost in North Carolina hospitals in 2017. Time-sensitive diagnosis is labeled as the nominal variable operationalized as chest pain and or chronic obstructive pulmonary disease. The total cost of hospital charges is the dependent variable.

Data Analysis Plan

The data analysis plan consists of three phases: preparation, preliminary, and analysis phase. The preparation phase required emergency discharge data for North Carolina hospitals inputted in SPSS v23 (IBM Statistics, 2019). The preparation phase needs the utilization of SPSS to run descriptive frequency statistics and linear regression. The descriptive statistics will be performed to confirm if there are any data errors present or missing data. The analyzed data were retrieved from a secondary source, The Cecil G. Sheps Center for Health Services Research (2020), which is anticipated that there will be no errors or missing data. After the data is checked thoroughly for any missing values, errors, new variables, or variable recoding that needs to be done is completed.

The next phase is the preliminary analysis, which requires the test of parametric assumptions to be conducted. The study research questions are based on the prediction of various relationships amongst the independent and dependent. To explore the relationship of variables, linear logistic regression is conducted. Hoffman (1993) noted, a linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered an explanatory variable, and the other is a dependent variable. Hoffman further noted, the formula for a linear regression line is $Y=a+bX$, where Y is the dependent

variable and X is the explanatory variable. Multiple linear regression is conducted to address the relationship of time-sensitive diagnosis and length of stay, utilization of services, and total hospital charges. The covariate variable, such as age, was analyzed to determine the percentage of each time-sensitive diagnosis. The covariates were accustomed to possible confounding. The parametric assumption for logistic regression is the linearity of logit and multicollinearity in SPSS.

The final phase is the primary analysis, which addresses the three research questions and their relationship. To further explore the relationship amongst the variables requires checking and seeing valid inferences that can be made from regression and if it is typically distributed. For this study, the residuals were considered the error terms that distinguished the dependent variable, the observed value, and the predicted value. The next step is to check for homoscedasticity by monitoring the evenly distributed amounts or clustered together at certain benefits. Linearity is presented when the predictor variable is like the outcome variable (Vatcheva, McCormick and Rahbar, 2016). Multicollinearity is demonstrated when the predictor variables have a higher correlation with one another (Vatcheva, McCormick and Rahbar, 2016). The logistic regression is conducted three times based on the three research questions presented. If the p-value is less than 0.5, this represents a statistical relationship. If the p-value is less than 0.05, the odds ratio will be evaluated to determine which time-sensitive diagnosis significantly contributed to the model. The target population of those patients is diagnosed with chest and or chronic obstructive pulmonary disease is 40-years of age and older.

Threats to Validity

Internal validity refers to whether the conclusions are reached in the study are accurate. This study focuses on the most current data for the 2017 North Carolina Emergency Department

Discharge data. Maturation is an example of a threat of internal validity for this study. Maturation refers to the impact of time as a variable in a study (Slack and Draugalis, 2001). The target population is patients admitted within North Carolina Emergency departments over 40, diagnosed with time-sensitive diagnoses such as chest pain and or chronic obstructive pulmonary disease.

External validity refers to the generalizability of the results concluded from the study (Khorsan and Crawford, 2014). This study is based on data from North Carolina emergency departments. Results can be considered selection biased if it is based on one area of North Carolina. To avoid the risk of validity threats, this study uses all the 109 hospitals in the state of North Carolina.

Ethical Procedures

The secondary data retrieved from this study is available for researcher use only from the Cecil G. Sheps Center for Health Services Research. All information from the North Carolina Discharge database related to this study is found within the data. The data will not contain any personally identified information such as name, address, or social security number. An authorization password retrieved the file after a data use agreement form was approved. All protocols for the IRB will be followed to ensure there is no ethical violation for this research study and to ensure the IRB Standards.

Summary

The purpose of the proposed secondary quantitative research study is to explore the relationship of the time-sensitive diagnosis of patients within the emergency departments related to the throughput process and hospital outcomes. Data obtained by The Cecil G. Sheps Health Services and Research (2020), a state-funded government organization under contract by the

Division of Health Service Regulation (DHSR) to maintain, for use in research and state health planning, N.C. Hospital Discharge Data (Inpatient, Ambulatory Surgery/Outpatient, and Emergency Department Databases) collected by Truven Health Analytics (Truven). A data analysis process plan was developed to address the research questions presented in the study. This process consisted of the mentioned phases: data preparation, preliminary, and analysis. The utilization of SPSS v23 is needed to analyze the various variables and their relationships carefully.

Section 3 will further analyze the data presented in this study. This section will utilize the methodology presented in the previous section to interpret further and analyze the data presented. A vigilant analysis will be conducted to explore the relationship of time-sensitive diagnose patients admitted within the emergency department and their length of stay, utilization of services, and hospital charges.

Section 3: Presentation of the Results and Findings Section

Introduction

The objective of this study was to determine if there is a correlation between patients who have a time-sensitive diagnosis such as chest pain and COPD admitted within North Carolina emergency departments and their length of stay, utilization of services, and hospitalization cost. To addressed whether a statistically significant relationship was present within this study, various statistical analyses were performed.

RQ1: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017?

H1o (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017.

H1a (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017.

RQ2: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017?

H2o (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017.

H2a (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017.

RQ3: Is there a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease and hospitalization cost within North Carolina emergency departments in 2017?

H3o (null hypothesis): There is no relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization costs among North Carolina hospitals in 2017.

H3a (alternative hypothesis): There is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization costs among North Carolina hospitals in 2017.

This section will analyze the secondary data set provided by The Cecil G. Sheps Center for Health Services Research using IBM SPSS. A descriptive table, univariate model, and ANOVA will be conducted to determine if the null hypothesis in the above research questions is statistically significant and whether the null hypotheses were rejected or failed to be rejected.

Data Collection of Secondary Data Set

The secondary data obtained for this study were retrieved from The Cecil G. Sheps Center for Health Services Research. The data obtained consisted of North Carolina Emergency Departments data for 2017. The data included is limited to the following: time-sensitive diagnoses such as chest pain or chronic obstructive pulmonary disease, utilization of services,

length of stays, and hospitalization cost. The hospital data collected for this study is derived from North Carolina Hospital data from 2017. With IRB approval and data use agreement, there will be no discrepancies presented in this secondary data.

The Cecil G. Sheps Center for Health Services Research (2017), North Carolina Emergency Department Hospital Data for 2017 indicated 1,048,573 emergency department visits. In 2017 North Carolina Emergency Department data indicated there were 14,869 patients admitted and diagnosed with chest pain and 2,459 patients admitted and diagnosed with chronic obstructive pulmonary disease.

Data Analysis

The data provided from The Cecil G. Sheps Center for Health Services Research of North Carolina emergency department admitting diagnosis was uploaded into SPSS. I then had to select the data related to the following time-sensitive diagnosis: chest pain and COPD by utilizing the split case file in SPSS. I created a new dataset with only the data related to admitted patients with time-sensitive diagnoses such as chest pain and COPD with the North Carolina emergency department in 2017.

The first procedure performed in IBM SPSS was to organize the data by case file using the split case file function and selecting compared groups. This function categorized the data by chest pain or COPD. The following procedure performed was a univariate model to explore the relationship between time-sensitive diagnosis and services utilization, length of stay, and overall hospitalization cost. The univariate model provided the descriptive statistics of each independent variable (length of stay, utilization of services, and overall hospitalization cost). This model also ran a test between the subjects of the dependent variable (chest pain or COPD) and the independent variables to determine a statistical relationship.

Various analysis was performed to examine the data further to explore the impact of a time-sensitive diagnosis of admitted patients within North Carolina emergency departments and their length of stay, utilization of services, and overall hospitalization cost. A separate descriptive table analysis to describe the significant impact for each independent variable against the dependent variable. A univariate model was conducted to explore the statistical association with patients admitted with time-sensitive diagnoses such as chest pain and COPD. This model results can further determine a statistically significant relationship with patients admitted with North Carolina emergency departments who have time-sensitive diagnoses such as chest pain and COPD related to the length of stay, utilization of services, and overall hospitalization cost.

Results

A total of 17,328 patients were admitted within North Carolina Emergency Departments with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease in 2017. This baseline descriptive is shown in Table 1 indicates there were 2,459 patients diagnosed with chronic obstructive pulmonary disease and 14,869 patients diagnosed with chest pain admitted within North Carolina emergency departments in 2017.

Table 1

Descriptive Statistics Summary of Admitted Patients within North Carolina with Time Sensitive Diagnosis such as Chest Pain or COPD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chest Pain	14869	85.8	85.8	85.8
	COPD	2459	14.2	14.2	100.0
	Total	17328	100.0	100.0	

The first research question of this study is to determine if there is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive

pulmonary disease within North Carolina emergency departments and length of stay. A descriptive statistic table was created using SPSS to describe the average independent variable (length of stay) compared to dependent variables (time-sensitive diagnosis such as chest pain or COPD). Table 2 indicates admitted patients with time-sensitive diagnoses such as Chronic Obstructive Pulmonary disease within North Carolina emergency departments' average stay was four days. In contrast, for admitted patients with Chest Pain, the time-sensitive diagnosis average stay is two days.

Table 2

Descriptive Statistics of Length of Stay of Time Sensitive Diagnosis of Admitted Patients Within North Carolina Emergency Departments in 2017

Dependent Variable: Length of stay (LOS)

recode admitx	Mean	Std. Deviation	N
COPD	4.36	4.208	2459
Chest Pain	1.89	4.100	14869

Note: The data output for descriptive statistical analysis utilizing a sample size of 17,328 patients admitted within North Carolina emergency departments with time sensitive diagnosis such as: chest pain or COPD

A univariate test was performed in SPSS to determine whether there is a significant relationship with patients admitted within North Carolina emergency departments with chest pain compared to COPD and length of stay. The univariate conducted test compares two subjects while exploring the relationship with the dependent variable. Table 3 Tests of Between- Subjects indicates the significance value for admitted patients with chest pain or COPD is 0.00. Therefore, we can assume a statistically significant relationship, $p<0.05$, with the length of stay and times-sensitive diagnosis such as COPD and chest pain.

Table 3

Tests of Between- Subjects Effects time sensitive diagnosis of admitted patients with chest pain or COPD and their length of stay within North Carolina Emergency Departments in 2017

Dependent Variable: dayscov

recode admitx	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
COPD	Corrected Model	.000[a]	0	.	.	.	.000
	Intercept	46786.123	1	46786.123	2642.235	.000	.518
	Error	43523.877	2458	17.707			
	Total	90310.000	2459				
	Corrected Total	43523.877	2458				
Chest Pain	Corrected Model	.000[a]	0	.	.	.	.000
	Intercept	53070.434	1	53070.434	3157.435	.000	.175
	Error	249902.566	14868	16.808			
	Total	302973.000	14869				
	Corrected Total	249902.566	14868				

a. R Squared = .000 (Adjusted R Squared = .000)

The second research question of this study is to determine if there is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017. A descriptive statistic table was created using SPSS in which the purpose is to describe the average of an independent variable (utilization of services) compared to dependent variables (time-sensitive diagnosis such as chest pain or COPD). To determine the utilization of services, the total amount of recurring charges will be further examined. The findings suggest in Table 4 is the average cost for utilization of services for patients with time-sensitive diagnoses such as chest pain and COPD admitted within North Carolina. Results indicate that the average price of the utilization of services for admitted patients with COPD is $3,817.16, with a standard deviation of $3,601.19. The average cost of utilization of services for admitted patients with chest pain is $608.22, with a standard deviation of $2,977.59.

Table 4

Descriptive Statistics of utilization of services of time sensitive diagnosis of admitted patients within North Carolina Emergency Departments in 2017

Descriptive Statistics

Dependent Variable: Routine Charges

recode admitx	Mean	Std. Deviation	N
COPD	3817.1616	3601.19979	1712
Chest Pain	608.2201	2977.59964	14869

A univariate test was performed in SPSS to determine whether there is a significant relationship between patients admitted within North Carolina emergency departments with chest pain and COPD and services utilization. The univariate conducted is a test that compared two subjects (COPD and chest pain) while exploring the relationship with the utilization of services. Table 5 Tests of Between- Subjects Effects of the utilization of services of time-sensitive diagnosis of admitted patients within North Carolina Emergency Departments in 2017 indicates the significance value for admitted patients with chest pain or COPD is 0.00. Therefore, we can conclude there is a relationship between time-sensitive diagnoses such as chest pain or COPD and the utilization of services. As we know statistically, the significance relationship can be determined as p value<0.05.

Table 5

Tests of Between-Subject Effects of utilization of services of time sensitive diagnosis of admitted patients within North Carolina Emergency Departments in 2017

Tests of Between-Subjects Effects

Dependent Variable: Routine Charges

recode admitx	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared

COPD	Corrected Model	.000[a]	0	.	.	.	.000
	Intercept	24945077540.521	1	24945077540.521	1923.492	.000	.529
	Error	22189342876.909	1711	12968639.905			
	Total	47134420417.430	1712				
	Corrected Total	22189342876.909	1711				
Chest Pain	Corrected Model	.000[b]	0	.	.	.	.000
	Intercept	5500513427.198	1	5500513427.198	620.398	.000	.040
	Error	131821168798.456	14868	8866099.596			
	Total	137321682225.662	14869				
	Corrected Total	131821168798.464	14868				

a. R Squared = .000 (Adjusted R Squared = .000)

b. R Squared = .000 (Adjusted R Squared = .000)

The last question of this study is to determine if there is a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and hospitalization costs among North Carolina hospitals in 2017? To determine whether there is a statistically significant relationship between patients who are diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and overall hospitalization cost, a descriptive statistic table was created using SPSS to provide the average of the independent variable (overall hospitalization cost) compared to dependent variables (time-sensitive diagnosis such as chest pain or COPD). Table 6 provides the average overall hospitalization cost for patients admitted with time-sensitive diagnoses such as chest pain or COPD with North Carolina emergency departments in 2017. Admitted patients with North Carolina emergency departments in 2017 overall hospitalization average cost for patients with

COPD was $24,269.89 with a standard deviation of $23,766.89 and chest pain $16,349.16 with a standard deviation of $29,939.61.

Table 6

Descriptive Statistics of overall hospitalization cost of time sensitive diagnosis of admitted patients within North Carolina Emergency Departments in 2017

Descriptive Statistics

Dependent Variable: Total Charges

recode admitx	Mean	Std. Deviation	N
COPD	24269.8900	23766.22657	2459
Chest Pain	16349.1600	29839.61356	14869

Another univariate test was performed in SPSS to determine whether there is a significant relationship with patients admitted within North Carolina emergency departments with chest pain compared to COPD and overall hospitalization. The univariate conducted is a test that compared two subjects (COPD and chest pain) while exploring the relationship with the overall hospitalization cost. Table 7 Tests of Between- Subjects Effects of overall hospitalization cost of admitted patients with time-sensitive diagnosis such as chest pain or COPD within North Carolina Emergency Departments in 2017 indicates the significance value for admitted patients with chest pain or COPD is 0.00. Therefore, we can conclude there is a relationship between time-sensitive diagnoses such as chest pain or COPD and the utilization of services. As we know, a statistically significant value can be determined as p value<0.05.

Table 7

Tests of Between-Subjects Effects of admitted patients with time sensitive diagnosis and hospitalization cost

Tests of Between-Subjects Effects

Dependent Variable: Total Charges

recode admitx	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
COPD	Corrected Model	.000[a]	0	.	.	.	.000
	Intercept	1448418767661.966	1	1448418767661.966	2564.329	.000	.511
	Error	1388360805693.729	2458	564833525.506			
	Total	2836779573355.697	2459				
	Corrected Total	1388360805693.725	2458				
Chest Pain	Corrected Model	.000[b]	0	.	.	.	.000
	Intercept	3974409839664.622	1	3974409839664.622	4463.610	.000	.231
	Error	13238504927347.336	14868	890402537.486			
	Total	17212914767012.000	14869				
	Corrected Total	13238504927347.416	14868				

a. R Squared = .000 (Adjusted R Squared = .000)

b. R Squared = .000 (Adjusted R Squared = .000)

To further explore the data of this study, a linear regression model was conducted to examine times-sensitive diagnosis patients with chest pain and COPD, length of stay, utilization of services, and its impact on overall hospitalization cost. The outputs in Table 8 show the model summary and overall fit statistics. We find that the adjusted R^2 of our model's adjusted R<UNK> is 0.96, which means that the linear regression explains 96% of the variance in patients with time-sensitive diagnoses such as chest pain or COPD can be explained by the length of stay and utilization of services and overall hospitalization cost. Table 9 consists of an ANOVA table, which determines whether the predictor variables: length of stay, utilization of services, and overall hospitalization cost remain statistically significant with time-sensitive diagnoses such as chest pain and COPD. Table 9 shows that F (3, 17324) = 2680.571, p = 0.00, which is statistically significant. Table 10 is the Coefficient table which furthers examine a positive or negative relationship with admitted patients who have a time-sensitive diagnosis such as chest

pain or COPD. The line equation that uses a length of stay to predict time-sensitive diagnoses such as chest pain or COPD is *y*= -0.004X+.922, *t*-test value -5.679 with a statistical value of 0.00. The equation of the line that uses utilization of services to predict time-sensitive diagnoses such as chest pain or COPD is *y*=-2.775E-5X+.922, *t*-test value -32.031 with a statistical value of 0.00. The equation of the line that uses utilization of services to predict time-sensitive diagnoses such as chest pain or COPD is *y*=5.341E-7X+ .922, *t*-test value 5.907 with a statistical value of 0.00. Therefore, we can conclude that the length of stay, utilization of services, and overall hospitalization cost all have a statistical significance relationship.

Table 8

Model Summary of admitted patients with time sensitive diagnosis length of stay, utilization of services, and hospitalization cost

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.309[a]	.096	.096	.289

a. Predictors: (Constant), Total Charges, Routine Charges, dayscov

Table 9

ANOVA of admitted patients with time sensitive diagnosis length of stay, utilization of services, and hospitalization cost

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4679136291742.014	3	1559712097247.338	2680.571	.000[b]
	Residual	10080109407704.545	17324	581858081.719		
	Total	14759245699446.559	17327			

a. Dependent Variable: Total Charges

b. Predictors: (Constant), dayscov, agey, recode admitx

Table 10

Coefficients of admitted patients with time sensitive diagnosis length of stay, utilization of services, and hospitalization cost

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.922	.003		346.774	.000
	dayscov	-.004	.001	-.057	-5.679	.000
	Routine Charges	-2.775E-5	.000	-.292	-32.031	.000
	Total Charges	5.341E-7	.000	.052	5.907	.000

a. Dependent Variable: recode admitx

Summary

This descriptive analysis was conducted to assess the variables and measurements presented within this study while utilizing quantitative analysis. The linear regression model was selected to examine further the relationship of admitted patients within North Carolina emergency departments who have a time-sensitive diagnosis such as chest pain or COPD and their length of stay, utilization of services, and overall hospitalization cost. The descriptive table presented above provided the average mean of the independent variables. The model summary table provided reported the strength of the relationship of the independent variables (length of stay, utilization of services, and hospitalization cost) and the dependent variable (time-sensitive diagnosis). The coefficient table further examines whether there is a positive or negative relationship with admitted patients with a time-sensitive diagnosis or chest pain or COPD.

The purpose of Section 3 was to address the research questions as followed, to determine if there was a statistically significant impact with admitted patients' patient within North Carolina emergency departments who have a time-sensitive diagnosis such as chest pain or

COPD and their length of stay, utilization of services and overall hospitalization cost. The above tables concluded that the independent variables: length of stay, utilization of services, and overall hospitalization cost have a statistical significance p-value of 0.00. Based on the finding presented in Section 3, we can conclude that patients admitted within North Carolina emergency departments who have time-sensitive diagnoses such as COPD and chest pain have a statistically significant relationship with the length of stay, utilization of services, and overall hospitalization cost.

Section 4 will present the previous data addressing the research questions of this study and apply it to the implication of social change. Section 4 will also provide the necessary recommendations that hospital administrators should implement to help improve the throughput process of time-sensitive diagnosis admitted patients with the emergency departments.

Section 4: Application for Professional Practice and Implication of Social Change

Introduction

Overcrowding within the emergency department has been a known global concern, creating a detrimental impact on hospitals' operationalization and financial costs (De Boeck et al., 2019). Emergency department overcrowding can be defined as the emergency department function is impeded primarily because of the excessive number of patients waiting to be seen, undergoing assessment and treatment, or waiting for departure and timeliness of services (Yarmohammadian et al., 2017). The purpose of this quantitative study was to explore the contributing factor of emergency department crowding, which is the association of the throughput process of admitted patients with a time-sensitive diagnosis within emergency departments and hospital outcomes. Quantitative data presented within this study was conducted by The Cecil Sheps Center for Health Services Research. It provided North Carolina admitted patients with time-sensitive diagnoses such as chest pain and COPD related to the length of stay, utilization of services, and overall hospitalization cost. This study determined a significant relationship between the impact of time-sensitive diagnosis patients admitted within emergency departments and hospital outcomes. The goal of exploring the association of inpatient boarding (throughput process) of time-sensitive diagnosis patients within the emergency departments will determine if there is a relationship and help create an innovative measure to alleviate emergency department crowding.

Interpretations of the Findings

To help explore the relationship of the significant impact time-sensitive diagnosed patients admitted within the emergency departments have on emergency department crowding related to overall hospital outcomes, three research questions were conducted for this study. A

quantitative analysis was conducted utilizing IBM SPSS version 25 to determine whether there was a significant relationship and any impact found with each research question presented within this study.

One of the most concerning impacts resulting from emergency crowding of inpatient boarding within the emergency departments is the relationship between the length of stay of patients admitted within the emergency department with time sensitive diagnoses. The goal of the first research question of this study was to determine whether there was a statistically significant relationship between time-sensitive diagnosis patients with chest pain or COPD and length of stay. Prior literature defined length of stay as the amount of time a patient resides within the hospital setting (Siletz et al., 2017). Prior studies indicated that the longer the throughput process for patients inboarding within emergency departments can increase the risk of patients leaving without being seen, increased length of stay, and higher mortality rates (Carmen et al., 2017). Based on the secondary data presented within this study, the average length of stay for admitted patients with time-sensitive diagnoses such as chest pain or COPD is likely to have a stay of 2-4 days in the hospital. The univariate model performed in Table 3 of Section 3 revealed a statistically significant relationship with admitted patients with time-sensitive diagnoses such as chest pain or COPD and length of stay within North Carolina Emergency Departments in 2017. This analysis also concluded that patients who are likely to have a time-sensitive diagnosis such as chest pain or COPD admitted within the emergency department tend to have a longer length of stay within the hospital. Therefore, we can agree with the alternative hypothesis. There is a relationship in patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and length of stay in 2017. We can further conclude that the longer the

length of stay of admitted patients within the emergency departments will increase overall utilization of services and overall hospitalization cost.

To further reconnoiter the impact of emergency overcrowding caused by the throughput process of inboarding patients with time-sensitive diagnoses such as chest pain or COPD within the North Carolina emergency departments and financial impact, further exploring the impact inboarding via emergency departments and utilization of services was conducted. The second research question presented in this study explored the relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost in North Carolina Hospitals in 2017. Schreyer and Martin (2017) conducted a study analyzing the overall cost of time-sensitive diagnosis and utilization of services. The results of this study revealed that the costs per patient bed-hour were determined to be significantly higher within the emergency department compared to the inpatient floor, observation unit, and or the admissions holding unit. The study concluded that the lack of untreated time-sensitive diagnoses caused a significant increase in the utilization of services. A univariate regression model was performed to determine if there was a relationship between patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and utilization of services cost. The results revealed a statistical significance value of 0.00, which we can agree with the alternative hypothesis, there is a relationship with patients who are diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments, and utilization of services cost in North Carolina Hospitals in 2017.

Exploring the overall hospitalization cost is needed to discover further the significant impact of emergency department crowding caused by the throughput process of inpatient boarding within emergency departments with a time-sensitive diagnosis. As mentioned in Section 3, a univariate model was conducted to explore the relationship of patients admitted with time-sensitive diagnoses such as chest pain or COPD with North Carolina emergency departments in 2017 and overall hospitalization cost. This analysis confirmed a statistically significant relationship with patients admitted with time-sensitive diagnoses such as chest pain or COPD with North Carolina emergency departments and overall hospitalization cost. As mentioned in prior literature in Section 1, Schreyer and Martin (2017) results indicated the total cost to the institution of boarded patients for one year was determined to be $877,290 (Schreyer and Martin, 2017). The overall results of this study concluded there was a significantly increased overall hospitalization cost with patients who were admitted within the emergency department. Another univariate regression model performed within this study compared patients admitted within North Carolina emergency departments with time-sensitive diagnoses such as chest pain or COPD and hospitalization cost to determine if a relationship was present. Results from this model revealed a statistical significance value of 0.00, which we can agree with the alternative hypothesis, there is a relationship with patients who are diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments, and overall hospitalization cost in North Carolina Hospitals in 2017.

The goal of this study was to determine whether there was a significant relationship with admitted patients via North Carolina emergency departments with time-sensitive diagnoses such as chest pain or COPD and patient's length of stay, utilization of services, and overall hospitalization cost. A univariate model was performed for each independent variable against

each dependent variable to determine if a statistical relationship was present. The results from the quantitative data presented within this study found a significant relationship with patients who have a time-sensitive diagnosis admitted within North Carolina emergency departments and length of stay, utilization of services, and overall hospitalization cost. A statistically significant relationship was found for the three research questions of a value of 0.00. Therefore, we can conclude the findings of this study agreed with our alternative hypothesis for research question one, two and three, patients admitted within emergency departments in North Carolina who has a time-sensitive diagnosis such as chest pain or COPD have a statistically significant relationship with patients' length of stay, utilization of services and overall hospitalization `cost. As mentioned, prior studies recognized that emergency crowding had been a globally known issue that has caused a tremendous impact on hospitals' financial, organizational, and overall outcomes. There has been limited literature exploring the relationship of an underlying factor that contributes to emergency crowding, such as admitted patients within the emergency department who have time-sensitive diagnoses. It is crucial to explore the relationship between time-sensitive diagnosed patients admitted within the emergency department and its impact on hospital outcomes.

Limitations of the Study

There were several limitations found within this secondary quantitative dataset. Firstly, the data provided by The Cecil G. Sheps Center for Health Services Research were limited to patients admitted within North Carolina emergency departments during the year 2017. Therefore, the generalizability of the findings of this study was limited. Secondly, the data presented consisted of several missing diagnosis fields of those patients admitted within the emergency

department. The lack of missing diagnosis data of some patients could indicate other factors such as patients left before being seen, which was not provided within this data.

Additionally, the quantitative data presented from this study were derived from the secondary data set provided by The Cecil G. Sheps Center for Health Services Research. Data retrieved from secondary data limited the influence over the procedures of personally collecting data for this study.

Recommendations

This research study analyzed factors that influence emergency crowding, such as patients admitted within the emergency department who have sensitive diagnoses (chest pain or COPD) and hospital outcomes. The goal was to explore the relationship of patients with time-sensitive diagnoses such as chest pain or COPD admitted within North Carolina emergency departments and patient's length of stay, utilization of services, and overall hospitalization cost to help reduce emergency crowding. Data were provided by The Cecil G. Sheps Center for Health Services Research in Chapel Hill, North Carolina. Although data were accessible for research, a more extensive sampling and literature review would be proposed to close the knowledge gap further.

Emergency crowding is a current global concern worldwide, but few researchers have carefully examined the influence and relationship of contributing crowding factors, such as time-sensitive diagnosed patients admitted within emergency departments. The results and limitations of this study make it essential to highlight viable recommendations for future research within emergency departments throughout the world. One recommendation is to duplicate this study within other states. As prior literature mentioned, between 2000 and 2014, the number of annual emergency department visits in the United States rose to 33 million, while the number of

emergency department operations fell by 242 (Woodworth, 2020). Replicating this study among other states will help determine a more precise correlation.

Another recommendation for this study is to use an alternative approach such as qualitative data to explore the relationship and impact of time-sensitive diagnosed patients admitted within the emergency department and hospital outcomes. This study was analyzed and derived from quantitative secondary data provided by The Cecil G. Sheps Center for Health Services Research. A qualitative study will clarify the impact time-sensitive patients contribute to emergency department crowding within emergency departments. With further qualitative research, a researcher may conduct surveys from nurses and patients directly to help validate or disapprove the data presented within this study.

Implications for Professional Practice and Social Change

Implications for positive professional practice and social change include the prospective for improvement in reducing emergency crowding and improving hospital outcomes. Reducing emergency crowding will improve hospitals efficiency, hospitals operationalization, and hospital financial outcome. The exploration of determining whether a relationship exists between time-sensitive diagnosed patients admitted within the emergency department and hospital outcomes will have a positive social change on an individual, organizational, and societal level. The data from this study presented a statistically significant relationship with a time-sensitive diagnosis of admitted patients and length of stay, utilization of services, and hospitalization cost. Healthcare administrators and policymakers can now create a new approach to addressing time-sensitive diagnoses of patients admitted within emergency departments. Healthcare administrators can initiate a standard protocol for time-sensitive diagnosis during the throughput process to avoid longer wait times, patients leaving without being seen, and longer stays. Creating innovative

approaches addressing the emergency department throughput process will help improve hospital efficiency by reducing emergency crowding and reducing the length of stays, utilization of services, and overall hospitalization cost.

For the implication of positive social change, patients who have a time-sensitive diagnosis within the emergency department will receive adequate, timely care by improving the throughput process, which will promote optimal health while reducing emergency crowding. On a societal level, improving emergency crowding of time-sensitive diagnosed patients admitted within emergency departments will help promote healthier people and communities. Addressing time-sensitive diagnoses of admitted patients with the emergency department promptly will help reduce patients' length of stay. The length of stay for admitted patients with time-sensitive diagnoses will reduce the amount of leave absence patients use with their employer and increase productivity within the workforce.

Conclusions

This quantitative study resolved to address emergency department overcrowding by exploring the relationship of admitted patients with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments and its influence on their length of stay, utilization of services cost, and overall hospital cost. The independent variables analyzed for this study were patients diagnosed with time-sensitive diagnoses such as chest pain and chronic obstructive pulmonary disease within North Carolina emergency departments. The dependent variables analyzed for this study were the length of stay, utilization of services cost, and total hospital charges. The target population for this study included 15,393 diagnosed with chest pain and 2,459 diagnosed with chronic obstructive pulmonary disease within North Carolina Emergency Departments.

A logistic regression model was performed to explore the relationship of the variables presented in this study. Based on the results within this study, patients who were admitted within North Carolina emergency departments who had a time-sensitive diagnosis such as COPD and chest pain had a statistically significant relationship with the length of stay, utilization of services, and overall hospitalization cost. These findings relate to prior literature presented on the impact emergency crowding factors have on overall hospital outcomes. The theoretical foundation used for this study was the Donabedian Model, which addresses the following phases: structure, process, and outcome. The findings of this study aligned with the throughput process by exploring the following: length of stay, utilization of services, and overall hospitalization cost. A data analysis process plan was developed to address the research questions presented in this study. This study also revealed that patients who are likely to have a time-sensitive diagnosis such as chest pain or COPD admitted within the emergency department tend to have a longer length of stay within the hospital, an increase in the utilization of services, and overall hospitalization cost.

The findings of this study may be an asset to healthcare administrators, and policymakers in creating innovative processes for time-sensitive patients admitted within emergency departments. Further research is recommended globally to see if there is in correlation with a time-sensitive diagnosis within other state emergency departments. Expanding this research could help address emergency crowding on a global level. The reduction of emergency crowding can help improve hospital efficiency and outcomes.

References

Agency of Research and Quality. (2016). HCUP State Emergency Department Databases (SEDD). Healthcare Cost and Utilization Project (HCUP). 2009. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/seddoverview.jsp

Saad Al-Qahtani, S., Alsultan, A., Haddad, S., Alsaawi, A., Alshehri, M., Alsolamy, S., Arabi, Y. (2017). The association of duration of boarding in the emergency room and the outcome of patients admitted to the intensive care unit. *BMC Emergency Medicine, 17*(1). Retrieved from https://search-ebscohost-com.ezp.waldenulibrary.org/login.aspx?direct=trueanddb=edbandAN=126143714andsite=eds-liveandscope=site

Bradley, V. (2005). Placing emergency department crowding on the decision agenda. *Nursing Economics, 23*, 14-24.

Cecil G. Sheps Center for Health Services Research. (2020). The University of North Carolina at Chapel Hill. https://www.shepscenter.unc.edu/

Chang, A. M., Cohen, D. J., Lin, A., Augustine, J., Handel, D. A., Howell, E., Sun, B. C. (n.d.). *Hospital Strategies for Reducing Emergency Department Crowding: A Mixed-Methods Study, 71*(4), 497–505. https://doi-org.ezp.waldenulibrary.org/10.1016/j.annemergmed.2017.07.022

Clark, K., and Normile, L. (n.d.). Nursing informatics and data collection from the electronic medical record: Study of characteristics, factors and occupancy impacting outcomes of critical care admissions from the Emergency Department. Health Informatics Journal, 18(4), 309–319. https://doi-org.ezp.waldenulibrary.org/10.1177/1460458212454023

Cohen, R. Kennedy, H., Armitrano, B., Dillon, M., Guigui, S., Kanner, A., (2015). A quality improvement project to decrease emergency department and medical intensive care unit transfer times. http: dx.doi.org/10.1016

De Boeck, Carmen and Vandaele (2019). Needy boarding patients in emergency departments: an exploratory case study using discrete-event simulation. http://doi.org/10.101/j.orhc.2019.02.002.

Donabedian, A (1966). Evaluating the quality of medical care. Milbank Memorial Fund Quarterly, 44: 166–206.

Gaieski, D., Agarwal, A., Mikkelsen, M., Drumheller, B., Cham Sante, S., Shofer, F., Goyal, M. and Pines, J. (2017). The impact of E.D. crowding on early interventions and mortality in patients with severe sepsis. The American Journal of Emergency Medicine, 35(7), pp.953-960.

Golmohammadi, D (2016). Predicting hospital admissions to emergency department boarding. http://dx.doi.org/10.1016/j.jipe.2016.09.020

Hoffman, M. (1993). Linear Regression. In *The World of Almanac and Book of Facts 1993*. New York, NY: Pharos Books Improving Patient Flow and Reducing Emergency Department Crowding: A Guide for Hospitals (2018). The Agency Healthcare Research and Quality. Retrieved from: https://www.ahrq.gov/research/findings/final-reports/ptflow/section1.html

Ida Mentzoni, Stig Tore Bogstrand, and Kashif Waqar Faiz. (2019). Emergency department crowding and length of stay before and after an increased catchment area. BMC Health Services Research, (1), 1. https://doi-org.ezp.waldenulibrary.org/10.1186/s12913-019-4342-4

Khorsan, R., and Crawford, C. (2014). How to assess the external validity and model validity of therapeutic trials: a conceptual approach to systematic review methodology. Evidence-based complementary and alternative medicine: eCAM, 2014, 694804. https://doi.org/10.1155/2014/694804

Kripalani, S., Theobald, C. N., Anctil, B., and Vasilevskis, E. E. (2014). Reducing hospital readmission rates: current strategies and future directions. Annual review of medicine, 65, 471–485. doi:10.1146/annurev-med-022613-090415

Mccoy, J., Gale, A., Sunderram, J., Ohman-Strickland, P., Eisentein, R. (2015). Reduced hospital duration of stay associated with revised emergency department-intensive care unit admission policy: a before and after study, http://dx.doi.org/10.1016/j-jemermed.2015.06.067

McKenna, Heslin, Viccello, Mallon, Hernendez, Morley (2018). Emergency department and hospital crowding: causes, consequences, and cures. https://doi.org/10.15441/ceem.18.022

Mentzoni, I., Bogstrand, S.T. and Faiz, K.W. Emergency department crowding and length of stay before and after an increased catchment area. BMC Health Serv Res 19, 506 (2019). https://doi.org/10.1186/s12913-019-4342-4

Migita, R., Del Beccaro, M., Cotter, D., and Woodward, G. A. (2011). Emergency Department Overcrowding: Developing Emergency Department Capacity through Process Improvement. Clinical Pediatric Emergency Medicine, 12(2), 141. Retrieved from https://ezp.waldenulibrary.org/login?url=https://search.ebscohost.com/login.aspx?direct=trueanddb=edoandAN=62275955andsite=eds-liveandscope=site

Montgomery, P., Godfrey, M., Mossey, S., Conlon, M., and Bailey, P. (2014). Emergency department boarding times for patients admitted to intensive care unit: Patient an organizational influence. International Emergency Nursing, 22(2), 105–111. https://doi-org.ezp.waldenulibrary.org/10.1016/j.ienj.2013.06.004

Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L (2018) Emergency department crowding: A systematic review of causes, consequences, and solutions. PLoS one 13(8): e0203316. https://doi.org/10.1371/journal.pone.0203316

Moore, L., Lavoie, A., Bourgeois, G. and Lapointe, J. (2015). Donabedian's structure-process- outcome quality of care model. Journal of Trauma and Acute Care Surgery, 78(6), pp.1168-1175.

Nikpay, S., Freedman, S., Levy, H. and Buchmueller, T. (2017). Effect of the Affordable Care Act Medicaid Expansion on Emergency Department Visits: Evidence from State-Level Emergency Department Databases. Annals of Emergency Medicine, 70(2), pp.215-225.e6.

Ray, M. and Reinoso H. (2019). A new process to improve Throughput in the emergency Department. The Journal for Nurse Practitioners, 15(10), e193-e196. doi: http://dx.doi.org.ezp.waldenulibrary.org/10.1016/j.nurpra.2019.05.016.

Rudestam, K. E., and Newton, R. R. (2015). Surviving your dissertation: A comprehensive guide to content and process (4th ed.). Thousand Oaks, CA: Sage Publications.

Saad Al-Qahtani, Abdullah Alsultan, Samir Haddad, Abdulmohsen Alsaawi, Moeed

Alshehri, Sami Alsolamy, Afef Felebaman, et al. 2017. “The Association of Duration of Boarding in the Emergency Room and the Outcome of Patients Admitted to the Intensive Care Unit.” BMC Emergency Medicine 17 (1): 1–6. doi:10.1186/s12873-017-0143-4.

Salway, R., Valenzuela, R., Shoenberger, J., Mallon, W. and Viccellio, A. (2017). Emergency Department (E.D.) overcrowding: Evidence-Based Answers to Frequently Asked Questions. Revista Médica Clínica Las Condes, 28(2), pp.213-219.

Schreyer, K. E., and Martin, R. (2017). The Economics of an Admissions Holding Unit. The western journal of emergency medicine, 18(4), 553–558 doi:10.5811/westjem.2017.4.32740

Siletz, A., Jin, K., Cohen, M., Lewis, C., Tillou, A., Cryer, H. M., and Cheaito, A. (2017). Emergency department length of stay in critical nonoperative trauma. *Journal of Surgical Research*, *214*, 102–108. https://doi-org.ezp.waldenulibrary.org/10.1016/j.jss.2017.02.079

Slack, M., and Draugalis, J. (2001). Establishing the internal and external validity of experimental studies. American Journal of Health-System Pharmacy, 58(22), 2173-2181. doi: 10.1093/ajhp/58.22.2173

Vatcheva, K. P., Lee, M., McCormick, J. B., and Rahbar, M. H. (2016). Multicollinearity in Regression Analyses Conducted in Epidemiologic Studies. *Epidemiology (Sunnyvale, Calif.)*, *6*(2), 227. https://doi.org/10.4172/2161-1165.1000227

Weber, Showstack, Hunt, Colby Grimes and Bacchetti (2008). Are the uninsured responsible for the increase in emergency department visits in the United States? Annals of Emergency Medicine.

Wong, H. J., Morra, D., Caesar, M., Carter, M. W., and Abrams, H. (2010). Understanding

hospital and emergency department congestion: an examination of inpatient admission trends and bed resources. CJEM: Canadian Journal of Emergency Medicine, 12(1), 18–26. https://doi-org.ezp.waldenulibrary.org/10.1017/S1481803500011970

Woodworth, L. (2020). Swamped: Emergency Department Crowding and Patient Mortality. Journal of Health Economics, 70. https://doi-org.ezp.waldenulibrary.org/10.1016/j.jhealeco.2019.102279

Yarmohammadian, M. H., Rezaei, F., Haghshenas, A., and Tavakoli, N. (2017). Overcrowding in emergency departments: A review of strategies to decrease future challenges. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences, 22, 23. doi:10.4103/1735-1995.200277

Zodda, D., and Underwood, J. (2019). Improving Emergency Department Throughput: Evidence-Based Strategies Aimed at Reducing Boarding and Overcrowding. Physician Leadership Journal, 6(3), 70–73. Retrieved from https://search-ebscohost-com.ezp.waldenulibrary.org/login.aspx?direct=trueanddb=bthandAN=135860203andsite=eds-liveandscope=site