

University of San Diego

Digital USD

---

Dissertations

Theses and Dissertations

---

2020-5

## An Examination of the Night Burn Clinic Transition to Nurse Practitioner Coverage

Kevin J. Maxwell DNP, FNP-BC  
*University of San Diego*

Follow this and additional works at: <https://digital.sandiego.edu/dissertations>



Part of the [Family Practice Nursing Commons](#)

---

### Digital USD Citation

Maxwell, Kevin J. DNP, FNP-BC, "An Examination of the Night Burn Clinic Transition to Nurse Practitioner Coverage" (2020). *Dissertations*. 168.

<https://digital.sandiego.edu/dissertations/168>

This Dissertation: Open Access is brought to you for free and open access by the Theses and Dissertations at Digital USD. It has been accepted for inclusion in Dissertations by an authorized administrator of Digital USD. For more information, please contact [digital@sandiego.edu](mailto:digital@sandiego.edu).

UNIVERSITY OF SAN DIEGO

Hahn School of Nursing and Health Science

DOCTOR OF PHILOSOPHY IN NURSING

An Examination of the Night Burn Clinic Transition to Nurse Practitioner  
Coverage

By

Kevin J. Maxwell

A dissertation presented to the

FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE

UNIVERSITY OF SAN DIEGO

In partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY IN NURSING

May 2020

Dissertation Committee

Cynthia D. Connelly, PhD, RN, FAAN, Chairperson

Ruth A. Bush, PhD, MPH, FAMIA

Jane M. Georges, PhD, RN

UNIVERSITY OF SAN DIEGO  
Hahn School of Nursing and Health Science  
DOCTOR OF PHILOSOPHY IN NURSING

CANDIDATE'S

NAME: Kevin J. Maxwell

TITLE OF

DISSERTATION: An Examination of the Night Burn Clinic Transition to  
Nurse Practitioner Coverage

DISSERTATION

COMMITTEE:

---

Cynthia Connelly, PhD, RN, FAAN  
Chair

---

Ruth A. Bush, PhD, MPH, FAMIA,  
Committee Member

---

Jane M. Georges, PhD, RN  
Committee Member

## ABSTRACT

**Background/Significance:** Burns are dynamic, evolving wounds requiring prompt attention and treatment (Morgan et al., 2018). Many studies have been conducted comparing physician outcomes to those of APNs showing no difference (McCleery, Christensen, Peterson, Humphrey, & Helfand, 2011; Naylor & Kurtzman, 2010; Pioro et al., 2001; Roche, Gardner, & Jack, 2017; Spetz, Skillman, & Andrilla, 2017). Time delays which allow for progression of the injury have a negative impact on patient outcomes. Any pathway allowing for quicker review of the burn by a burn specialist should be welcomed (Kelly et al., 2013). APNs can augment physician efforts and expand access to care (Newhouse et al., 2011). Few research studies have been conducted in ambulatory settings where residents and APNs are directly compared. Studies which characterize the variability in the care provided in this population can better inform future staffing decisions.

**Purpose/Aims:** To describe the difference in visit length, pain scores and per patient revenue between patients cared for in an overnight burn clinic by APNs compared to resident physicians. Aim 1: To describe the demographic (age, gender, ethnicity) and clinical variables (time in clinic, pain, provider type) of patients seen in the overnight burn clinic. Aim 2: To examine the relationships among demographics (age, gender, Ethnicity), provider type, pain, and time in clinic in patients cared for in an overnight burn clinic. Aim 3: To identify factors (demographic, pain, and provider data) that explain the variance in the time spent in the clinic. A secondary aim is to examine the difference in revenue generated by APNs.

**Setting:** A regional burn center walk-in outpatient clinic at a southern California level 1

trauma center.

**Design:** Retrospective descriptive comparative design.

**Cases:** All patients who presented to the burn clinic between the hours of 6 pm and 6 am during the time period from October 1, 2015 to November 30, 2019.

**Methods:** Data were retrieved from the burn registry and the hospital EHR. Descriptive statistics were utilized to address Aim 1. Tests of association were used address Aim 2. Multivariable linear regression was used to address Aim 3. A simple comparison of revenue generated, addressed the secondary aim.

**Results:** Visit length was shorter for patients seen by nurse practitioners. There was no difference in opiate prescribing during the visit or at discharge. There was a dramatic increase in revenue during the first year.

**Conclusions:** Burn care is dynamic and evolving. More timely treatment and pain relief in a non-biased environment by specially trained providers has incrementally improved care provided to these vulnerable patients.

Copyright © Kevin Maxwell 2020

All Rights Reserved

## **DEDICATION**

I would like to humbly thank my partner and husband Jeffrey C. Hansen without whose help, support and indulgence, I would not have been able to pursue this endeavor. This work is dedicated to him.

None of this would have been possible without the support of our families throughout the years. Especially Carolyn Maxwell and Dorothy Hansen. This work is written in loving memory of our fathers. William H. C. Maxwell and Charles J. Hansen. Their inspiration and example through the years has been a constant source of strength.

To my members of my committee, I extend the most heartfelt thank you for all you have done to shepard me through this process. Dean Georges, your calm and supportive efforts on my behalf as well as your guidance through my years at the University of San Diego have been a great source of strength. Dr. Cynthia Connelly, I am at a loss for words and full of thanks for everything you have done for me. For giving me the time and space to grow as a nurse researcher while gently moving me along, I am eternally grateful. Dr. Ruth Bush, you have been a most wonderful professor, I appreciate your guidance, sense of humor and passion for statistics and epidemiology. Each of you have done so much to mold the students in your care into expert clinicians. I will carry this forward with me in my career.

Without the support of Dr. Jeanne Lee the director of the Burn Clinic, none of this would have ever gotten off the ground. Your support of APRNs and dedication to field of burn trauma through this long process is most appreciated.

## TABLE OF CONTENTS

CHAPTER I: INTRODUCTION.....	1
Historical Overview of Burn Management.....	1
Health Care Providers .....	2
Significance.....	4
Study Purpose and Aims.....	4
Conceptual Framework.....	5
CHAPTER II: LITERATURE REVIEW .....	8
Literature Search Methods.....	8
Rural Health Care .....	11
Emergency Care.....	12
Inpatient Care.....	13
Occupational Healthcare .....	14
CHAPTER III: METHODOLOGY .....	16
Conceptual Model .....	16
Research Design.....	17
Setting .....	17
Inclusion Criteria .....	18
Variables .....	19

Independent Variables .....	19
Dependent Variables .....	20
Data Collection Plan .....	20
Data Analysis .....	21
Summary and Significance .....	21
CHAPTER IV: RESULTS.....	22
Participants.....	22
Analyses.....	22
Aim 1 .....	22
Aim 2 .....	23
Aim 3 .....	24
Supplemental Analysis.....	25
Secondary Analysis.....	26
Summary .....	27
CHAPTER V: DISCUSSION OF FINDINGS .....	28
Study Summary.....	28
Study Findings .....	29
Conceptual Framework.....	29
Limitations .....	31
Implications for Practice .....	32

Implications for Health Policy .....	33
Future Research .....	34
Conclusion .....	34
References .....	36

#### LIST OF TABLES

Table 1. Demographic Characteristics Burn Patients .....	23
Table 2. Clinical Variables Burn Patients .....	24
Table 3. Supplementary Analysis .....	25
Table 4. Total Growth in Revenue .....	26

#### LIST OF FIGURES

Figure 1. Refined Quality Health Outcomes Model. ....	6
---	---

#### LIST OF APPENDICES

Appendix A: USD IRB .....	41
---------------------------	----

## **CHAPTER I**

### **INTRODUCTION**

Burns are dynamic wounds and among the most painful injuries. With a burn, there is damage to sensory nerves, as well as ensuing inflammation. The acute inflammatory response compounds the issue changing the burn pain into a multi-modal problem (Morgan et al., 2018). The extent a patient feels pain is to a large degree, determined by the depth of the injury. Superficial partial or deep partial thickness burns are often more painful than full thickness burns because the nerves have been damaged or lost. Full thickness burns are typically surrounded by areas of partial thickness burns contributing to the pain these individuals feel. Any delay in management or fluid resuscitation can lead to more burns of greater depth or make burns more challenging to heal (Morgan et al., 2018). Timeliness of care can diminish the extent of the injury and speed adequate wound care so pain management can occur. Burns have many causes and are complex. Time delays which allow for progression of the injury have a negative impact on patient outcomes. Any pathway allowing for quicker review of the burn by a burn specialist should be welcomed (Kelly et al., 2013).

#### **Historical Overview of Burn Management**

Modern methods for treating and evaluating burns have evolved rapidly since the early 1900's. Two significant urban fires namely, the Rialto Theatre fire in New Haven Connecticut of 1921 and the Coconut Grove nightclub fire in Boston of 1942 led to some salient observations. Patients were surviving the burn injury, yet later dying of shock days later (Oliver, 2019). Prior to fluid resuscitation methodology being developed in the 1940's and 1950's, there was high mortality

associated with even 10%-20% total body surface area (TBSA) injury. As recently as the 1970's, a burn greater than 30% TBSA was almost certain to lead to death in an older patient (Oliver, 2019). Advances in the management, evaluation, and treatment have improved dramatically to the point where the prognostic burn index (PBI), which is the patient's age and TBSA added together to arrive at a number, which if it approaches 100 has been indicative of low survivability; currently, mortality rates have dropped to 50-70% (Oliver, 2019). Managing fluid needs, inflammation, and the inflammatory response in an acute burn injury is far in excess of what one sees in trauma or sepsis (Endorf & Dries, 2011). Early evaluation of the extent of a burn injury is vital in the first hours following the event. Decisions regarding the need to manage a burn injury in the hospital or in the ambulatory care setting are frequently handled through the burn clinic overnight. Typically, any patient requiring fluid resuscitation for burns greater than 20% TBSA or surgical intervention with full thickness injury are managed as inpatients. Partial thickness injuries of even 10-15% can be managed in ambulatory care settings in a healthy adult. Contraindications for ambulatory care management include the very young, elderly, those with co-morbid conditions, and intolerance to wound care due to pain.

### **Health Care Providers**

Past institutional practice involved tasking physician residents with coverage of the night burn clinic in a large academic southern California burn center. Residents who care for patients in the intensive care unit, incoming trauma patients, and surgical cases are unable to prioritize seeing patients presenting to a small ambulatory clinic with non-

life-threatening injury. Earlier studies in outpatient settings have shown Advanced Practice Nurses (APNs) can manage a wide variety of problems and achieve similar patient outcomes as physicians (Knickman et al., 1992). Care from an APN has advantages. APNs use a holistic approach, spend more time with patients, and are less costly than physicians (Mundinger, 1994). Patients receiving care from an APN may be linked to improvements in compliance and satisfaction (Thompson et al., 1982).

Physician residents rotate on a 4-week schedule and have varying levels of experience managing acute burn injury. This results in long wait times prior to being seen, receiving any pain relief, or definitive burn treatment. Nursing staff are unable to administer any treatment prior to the patient being seen by a provider. In contrast, APNs working in a burn clinic can prioritize seeing patients without having to delay care, while attending to more critically ill patients. APNs with specialty training in burn management with attending physician oversight are better equipped to manage patients in this setting. Patients seen by residents are not billed for provider services and instead are charged a basic facility charge. Nurse Practitioners (NPs) can bill for provider services.

Patients seen in the burn clinic typically have isolated burn injuries of less than 20% total body surface area (TBSA), are hemodynamically stable, and have no conditions which would require more immediate intervention. Patients with inhalation injuries, mental health concerns, drug use/overdose, or hemodynamic instability are managed in the emergency department with burn APN consultation. Patients meeting these criteria are sent immediately to the burn clinic for evaluation and treatment. Gaps exist in the literature which evaluate the differences in care between burn clinic patients seen by resident physicians and those seen by NPs with specialty training.

## **Significance**

Many studies have been conducted looking at outcomes of APNs compared to physicians in a variety of settings. Few research studies have been conducted in ambulatory settings where residents and APNs were directly compared, and none have been conducted in patients suffering from burns. Considering the current climate regarding the desire to increase APN autonomy and practice to the full extent of their training, studies which characterize the variability in the care provided in this population can better inform future decisions.

## **Study Purpose and Aims**

The purpose of the study is to investigate the difference in visit length, pain scores, and per patient revenue between patients cared for in an overnight burn clinic by APNs compared to resident physicians.

Specific Aims:

Aim 1: To describe the demographic (age, gender, ethnicity) and clinical variables (time in clinic, pain, provider type) of patients seen in the overnight burn clinic.

Aim 2: Examine the relationships among demographics (age, gender, ethnicity), provider type, pain scores, opiate prescribing data, specialist consult, and time in the clinic for this cohort of patients.

Aim 3: To identify factors (demographic, pain, and provider data) that are associated with the variance in the time spent in the clinic.

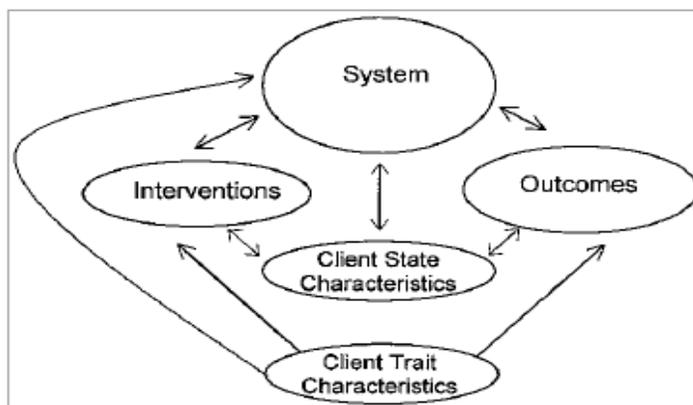
A secondary aim is to examine the difference in revenue generated by APNs.

## Conceptual Framework

The concepts of timeliness, effectiveness, and quality are linked and integral to any study aiming to measure improvements in patient care. Through the conceptual model, relationships which reveal themselves while attempting to examine the phenomena being studied. The conceptual model provides a way to guide inquiry. It provides a path forward and a way to view information collected. (Polit & Beck, 2012). Research questions were formulated utilizing core components of this theory and helped to guide the research. Donabedian's paper, evaluating the quality of medical care in 1973 describes a three-pronged linear approach examining structure, process, and patient outcomes when assessing patient care (Donabedian, 1973). This model has been further adapted over the years by a number of authors, most notably the American Academy of Nursing Expert Panel on Quality Care, who developed a more bidirectional model of feedback loops to more accurately assess the contribution of nursing care to the evaluation of the outcomes. (Mitchell et al., 1998). The Quality Health Outcomes Model allows us to examine the bidirectional nature of interventions and their effects on health system characteristics and patient characteristics. Interventions are affected by patient characteristics and the health system structure in producing patient outcomes. (Mitchell et al., 1998). The QHOM has been further modified in work done by Mayberry and Gennaro in the field of obstetrics where a relationship exists directly between interventions and outcomes. "Analysis of these components can provide a comprehensive picture of the complexity of patient care decision making in hospital labor and delivery units"(Mayberry, L.J. & Gennaro, S., 2001). Building on this framework, a

model has emerged taking client state characteristics and client trait characteristics into account (Radwin, 2002). Client state i.e. characteristics which can change depending on the system, interventions and outcomes are separated from client trait characteristics which do not change but can influence the system, interventions and outcomes. Examples of client trait characteristics are gender, ethnicity, education, age, and medical history. The refined quality health outcomes model which refines the QHOM in order to include changeable and non-changeable patient conditions with inform this study, help refine the statistical analysis, and create a more complete understanding of the interplay of structure, process, outcomes, and patient state, accounting for differences in patient trait.

*Figure 1.* Refined Quality Health Outcomes Model.



The main structural change in this study involves the transition from physician resident coverage of the burn clinic to APNs. The process change implemented involves having APNs available and tasked with prioritizing burn clinic patients and being given

the autonomy to diagnose and treat patients in an independent and sometimes rapid manner in order to further expedite care delivered. Outcome measures seek to quantify these changes in order to measure the impact of the changes on the care delivered.

Patient state characteristics and patient trait characteristics will be examined and analyzed for variability in outcomes. In the event there are no measurable differences, conclusions may be drawn regarding the equivalence of the care provided by residents and APNs. In this way, the theoretical framework and refined QHOM conceptual model have guided and explicated the study and questions. The foundation is in place to undertake a study which will measure the effects of transitioning to APN coverage of the burn clinic.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **Literature Search Methods**

To establish a thorough review of the literature, the following steps were employed. An electronic search of published journal articles was conducted using the following databases: CINAHL, EBSCO, PubMed, and MedlinePlus. Peer reviewed manuscripts on adult patients with burn injury, published between the dates of 1973-2020 were obtained. The key works used for this literature search included burn, burn pain, management of burns; research articles included randomized controlled trials, observational, descriptive, cohort, and interventional studies.

Prior studies have been conducted that compare the care delivered by APNs either independently or as part of a team of providers. In *Advanced practice nurse outcomes 1990-2008: a systematic review*, Newhouse et al were able to show that APNs play an important role in improving patient care quality and provide effective high-quality care in the United States. APNs can augment physician efforts and expand access to care (Newhouse et al., 2011). They were able to show that outcomes were similar and in some instances the outcomes were better when APN's were involved vs care provided by physicians alone. (Newhouse et al., 2011). APNs also have a commitment to building healthier communities with expertise and a skill set geared toward health promotion and teaching tailored to patient traits, living situation, and community health (Flynn, B.C., 1997).

As part of the VA's evidence-based synthesis program, a review was conducted investigating the quality of care provided by APNs. The team sought to examine studies comparing APN care vs physician care across multiple settings with the purpose of investigating the validity of the assertions that APN care and physician care are equivalent. Their findings support and reinforce the belief there is no difference in outcomes across multiple settings, patient status, or mortality, however the strength of the evidence thus far has been minimal (McCleery et al., 2011). They go on to state however, that while the strength of the evidence is low, it should not lead one to conclude additional randomized control trials would be necessary to support APN care is comparable. Provider data routinely collected at the VA where independent APNs provide care should improve the accuracy of these assertions and be a better source of information (McCleery et al., 2011). They found APNs tend to see fewer and less complex patients within the VA system. APNs did not use more resources than physicians and provider type was not associated with elevated creatinine or blood pressures in patients with diabetes or hypertension. HbA1c was also not significantly different in VA patients with diabetes seen by APNs (McCleery et al., 2011). One key question left unanswered in this review is whether the setting of practice influences the quality of care delivered by APNs. There are a few studies comparing quality of care across practice settings. To date no published studies have been found which were conducted in an ambulatory burn clinic setting.

It is important to understand the meaning of independence and autonomy to the APNs as it relates to their practice and how this study fits into the body of evidence contributing to the progression of the nursing profession. Weiland (2015) conducted a

Gadamerian hermeneutic study examining the meaning of autonomy as interpreted by APNs through their lived experiences of everyday practice in primary health care (Weiland, 2015). Four main themes arose from this qualitative analysis examining the meaning of having genuine APN practice for the participants. Building relationships with patients and becoming their provider with the responsibilities inherent in that interaction without having to answer to anyone else regarding choices made in the shared decision-making process was one component. Self-reliance and the idea of being alone and not having to answer to anyone was an important characteristic and inherent part of the APNs perception of autonomy. Being alone in the role, but still connected to the patient was an important theme (Weiland, 2015). Self-empowerment is interwoven with the concept of being right, it builds confidence in one's abilities to appropriately treat patients within scope of practice and reinforces confidence, competence, ability, and skill set. The concept of what's right for the patient is also being right for the participant." (Weiland, 2015). Weiland's final theme was defending the NP role where multiple professional and emotional contexts intertwine. Having to defend one's role and title for example, being labeled a mid-level provider rather than a primary care provider and the everyday challenges APNs face in interactions with physicians, the public, and fellow APNs. Meaning and autonomy are shaped in the daily work day challenges supported by belief in their own abilities and who they are. (Weiland, 2015).

APNs in the burn clinic are practicing with a high degree of autonomy. Decisions regarding patient care and management are completed independently with attending physician oversight and consultation for pediatric cases. Patients requiring admission to

the hospital burn unit are staffed with the on duty attending physician. Most patients are treated and discharged from the clinic in a completely autonomous manner.

The literature can be separated into four broad categories. Rural healthcare where there has been the greatest need for primary care providers, Emergency/urgent care, inpatient settings, and occupational health care. Overall, the trend remains the same, NPs provide care that is equivalent to that of physicians. An examination of the studies follows.

### **Rural Health Care**

The nation's first NP program at the University of Colorado was envisioned as a program to expand the role of a public health nurse to help meet the needs of the rural population (Kippenbrock, 2017). A systematic review of literature published between 1990-2009 conducted by Stanik-Hutt et al. which compares multiple outcomes measures between APNs and MDs found similar outcomes for health status, functional status, lipid management, glucose management, blood pressure control and satisfaction. Mortality, ED visits and hospitalization rates were similar between the two groups of providers (Stanik-Hutt et al., 2013).

Healthcare provider shortages have been well documented in the literature. According to the U.S. Census Bureau there were approximately 21% of the population inhabiting rural areas as of 2000 (US Census Bureau, 2011). As of 2010 the percent of the population remained relatively stable at 19.3% yet the number of APNs practicing in the southern U.S. dropped from 59% in 2000 to 47% in 2010. During this timeframe, the number of APNs nearly doubled. Licensed Nurse Practitioners stand at 290,000 according to the AANP (American Association of Nurse Practitioners (AANP), 2020).

An ongoing deficit in the number of providers available to rural populations has led to the identification of advance practice providers potentially filling the role. The implementation of the Affordable Care Act has increased the need for healthcare professionals in rural communities. Spetz et al. (2017) identified differences in practice patterns, with APNs comprising a larger and larger percentage of rural healthcare providers. Specifically, primary care services have been provided by 50,000 APNs according to the Agency for Healthcare Research & Quality as of 2010 (Agency for Healthcare Research and Quality (AHRQ), 2012).

Access to primary care services is hampered by the uneven distribution of primary care providers. APNs and Physician Assistants (PAs) are working in rural areas to a much greater extent than physicians (16% vs 11%) with primary care APNs and Pas being more likely to practice in rural environments (AHRQ, 2012). APNs who practice in remote rural settings report they practice to the full extent of their state's legal scope of practice, are more satisfied with their ability to influence organizational policy, plan to remain in their positions, and more satisfied with their jobs (Spetz et al., 2017). Work-life balance, autonomy, and collaboration are vital to job satisfaction among APNs (Spetz et al., 2017).

### **Emergency Care**

Rural emergency departments are another venue seeing an increase in the number of practicing APNs. Roche et al. (2017) conducted a prospective longitudinal nested cohort study of rural emergency departments in Queensland, AU examining outcomes in patients presenting with chest pain. No difference was found between groups lending support to the idea that APNs are effective and safe providers, delivering high levels of

diagnostic accuracy in an acute care environment beyond simple presentations of minor illness and injury (Roche et al., 2017).

### **Inpatient Care**

In comparison to the many studies examining outpatient and ambulatory care, far fewer studies have been conducted in the acute care inpatient environment. In hospital settings across the country, APNs typically function as part of multidisciplinary teams in collaboration with physicians (Naylor & Kurtzman, 2010). There are very few comparisons of outcomes among autonomous APNs and physicians (McCleery et al., 2011). The VHA Office of Quality, Safety, and Value commissioned the creation of an evidence brief to evaluate the most recent original studies examining health outcomes. (McCleery et al., 2011), Past studies conducted in the 1970s demonstrated APNs outcomes in primary care were comparable to those of physicians, namely the Burlington Randomized Trial of the Nurse Practitioner and the St. John's Randomized Trial of care. Outcomes were similar (Sharples, 2002). Studies included in the evidence brief from the VHA include four controlled trials in urgent care settings, three controlled trials in primary care, and three observational studies. Across the studies examined, they found no difference in the four measures they had identified (health status, quality of life, mortality, and hospitalizations). The strength of the evidence is described as low (McCleery et al., 2011). Within the VHA evidence brief, one study was held out as the best available evidence comparing relatively autonomous APNs and physician residents. Munding et al. (1994) examined the effectiveness of independent APNs caring for patients on an APN run ward compared to patients managed on a physician run ward. Scores on the Medical Outcomes Study Short-Form Health Survey (SF-36) found no

difference between the physician scores or the APN scores (APN group 40.53; physician group 40.60;  $p=0.92$ ) (Mundinger, 1994). Strengths of the Mundinger study include the number of subjects (1,316), randomization, and APNs had the same ability to admit, prescribe, consult, and refer, limitations of the study include 6 months duration, loss of randomization for follow up evaluation, and the data is now almost 25 years old (McCleery et al., 2011).

A similar study examined outcomes of patients in the inpatient setting where patients were randomized to an APN run ward and compared to a physician run ward in an academic teaching hospital. Once again, no statistically significant differences were identified between the two groups. APN and resident managed patients had similar outcomes ( $p > 0.1$ ) regarding resource utilization (length of stay, total charges, and ancillary charges), hospital costs (radiology, laboratory, respiratory therapy, and pharmacy), and rates of specialist consultation. Between the two groups, adverse event rates were similar. Of the patients returning home following hospitalization (90%), NPs arranged more home health services than physicians ( $p=0.046$ ). None of the endpoints of this study showed a difference between the two groups (Pioro et al., 2001).

### **Occupational Healthcare**

Occupational healthcare is another setting seeing an increase in the utilization of APNs as primary care providers, either in collaboration with or in place of physicians. There are a variety of roles for APNs in the occupational health setting. Primary care provider is a role that has been expanding since the American Association of Occupational Health Nurses (AAOHN) first commented on the developing opportunities in 1999. An updated report published in 2007, further reinforces the role of APN as

primary care provider (AAOHN, n.d.). Few studies have examined the effectiveness of APNs compared to physicians in this capacity. Guzik et al. (2009) sought to examine whether differences in patient satisfaction existed in the occupational health setting. Physician patient satisfaction scores utilizing the nine item Visit Specific Questionnaire (VSQ-9) were compared to APN patient satisfaction scores. No significant differences in APN and physician patient satisfaction scores utilizing the VSQ-9 were found on any of the sub-scales (Guzik A et al., 2009). This further supports the role of APN as primary care provider in this setting, adding yet another layer of evidence to the large body of work finding no difference in the care delivered by APNs compared to physicians.

Studies have consistently shown there is a minimal difference in outcomes between APNs and physicians and thus far the studies have been relatively consistent. As physician residencies change and hospitals cut back on resident hours, APNs are well equipped as providers to step in and fill the gap. An examination of any differences in the care provided by APNs practicing in the burn clinic would add to this body of evidence that no differences exist in the outcomes of patients seen by physicians compared to APNs.

## **CHAPTER III**

### **METHODOLOGY**

The purpose of the study was to investigate the difference in visit length, pain scores, and per patient revenue between patients cared for in an overnight burn clinic by APNs compared to resident physicians. In this chapter specific aims, study design, setting, data collection procedures, measures used, and data analysis will be presented.

#### **Specific Aims:**

Aim 1: To describe the demographic (age, gender, ethnicity) and clinical variables (time in clinic, pain, provider type) of patients seen in the overnight burn clinic.

Aim 2: To examine the relationships among demographics (age, gender, ethnicity) and provider type, pain scores, opiate prescribing data, specialist consult, and time in the clinic for this cohort of patients.

Aim 3: To identify factors (demographic, pain, and provider data) that were associated with variance in the time spent in the clinic.

A secondary aim is to examine the difference in revenue generated by APNs.

#### **Conceptual Model**

In the study conceptual model a number of independent variables contribute to the variation in time a patient spends in the clinic, the dependent variable. Provider role, measured by provider type (APN versus Resident), may affect the patient time spent in the clinic. General surgery residents have competing priorities compared to APNs, they care for patients in the intensive care units, participate in major trauma activations, and prioritize surgical cases. They are unable to break away from a critically ill patient or

surgical case in order to see clinic patients. There were anecdotal reports from the nursing staff that patients were having to wait for extended periods of time prior to being seen while the residents attended to more pressing matters, this may affect the patient time spent in the clinic. A patient's pain and the need to control it, measured by verbal pain scores, may affect the patient time spent in the clinic, as pre-medication prior to debridement with oral pain medications takes time to be effective. Age, especially among sub-samples of the very young or very old may also affect the patient time spent in the clinic, as well as decisions to admit the patient to the hospital (yes versus no). Finally, provider experience, measured by experience of a more senior resident or APN or lack of experience in a junior resident, may affect the patient time spent in the clinic as manifest in variability in visit length. The final aim of this study was to describe the difference in revenue generated by patients seen by residents compared to APNs and will be measured by a comparison of revenue generated in the year prior to and following implementation of the transition to APN coverage of the clinic.

### **Research Design**

This study was a quantitative approach utilizing a retrospective descriptive comparative design. The analysis used data capturing workflow and patient care during the 12 months before a complete transition from physician management to APN management, which occurred on October 1, 2016, and continuing to November 30, 2019.

### **Setting**

This study was conducted in a single burn clinic attached to a regional burn center in southern California. Hundreds of patients are treated yearly in the clinic, which is open 24 hours per day, seven days per week. It consists of two evaluation rooms

where the patient's burns are assessed. Wound debridement and treatment take place within the clinic. Overnight walk in patients are initially evaluated in the Emergency Department and if stable, are transported to the burn clinic for treatment. Individuals referred from other institutions arrive directly to the clinic either via ambulance or personal vehicle. Patients are either referred from clinics and other hospitals in the region after a telephone pre-screening by nurses in the burn unit. These patients present directly to the clinic. Patients who self-refer or arrive via ambulance are triaged in the emergency department. Patients without significant co-morbidities, stable vital signs, minimal airway involvement, and burns typically less than 20% total body surface area (TBSA) are safe to be seen in the burn clinic and transported to the unit. Individuals not falling into these categories are either seen in the emergency department or upgraded to a major trauma where appropriate fluid resuscitation can take place. The number of overnight walk-in patients varies from zero to five per night.

### **Inclusion Criteria**

All patients presenting for burn treatment and evaluation between the hours of 6 PM and 6 AM will be included in the study sample. Exclusion criteria include patients seen via the trauma bay, patients who were direct admits from other institutions, and patients seen by physician residents after the transition day. Regularly scheduled clinic patients and walk-in patients seen between 6 AM and 6 PM were excluded. Data will be extracted from the burn registry and the EHR. The health system IRB determined that no authorizations will be required to use or disclose PHI for this retrospective review.

All of the cases involving the need to see a specialist (n=9) were excluded from the statistical analysis. Any patient with suspected eye involvement, identified as blurry

vision, painful eyes, singed eyelashes or hair, are required to be seen by an ophthalmologist prior to discharge. These specialists cover two of the medical center locations and may not always be in house. This can increase the visit length by hours. Since one of the primary focuses of the study was to examine visit length by provider type, these cases were excluded from the analysis.

## **Variables**

**Independent variables.** Independent variables in this study include demographic data (age, ethnicity, gender), pain scores, provider type, time spent in the clinic, revenue generated, and whether the patient was admitted or discharged.

Age was measured by years.

Ethnicity was defined as: American Indian, Asian, Black, Hispanic, More than one category, Other, White and Unknown. Due to the small number of cases of patients self-identifying as American Indian, and “more than one”, they were combined into “Other”. Cases where the ethnicity is unknown were categorized as missing. In General terms, “race” can refer to physical appearance or inherited biological characteristics, while “ethnicity” refers to shared cultural traditions, language and origin (Hunt, L. M., & Megyesi, M. S., 2008). Race and ethnicity are routinely conflated in their common usage in health research, in this work, they are treated as a single construct “ethnicity.”

Gender was measured as self-identified male and female.

Pain scores was measured on a 0-10 verbal scale collected at the beginning of the visit and the last pain score prior to discharge.

Revenue generation was defined as billed visits during the 12 months prior to the transition date and the 12 months following implementation.

Admissions were defined as patients admitted to the hospital from the clinic during the initial visit.

**Dependent variable.** Visit length was measured as the time the patient is checked in until the After Visit Summary (AVS) is printed in minutes. Clinical variables for patients seen in the clinic were extracted from the EHR and included time in clinic, change in pain scores, if an opiate pain reliever was given prior to the visit (at an outside clinic, hospital, or EMS), administered during the clinic visit, and prescribed at discharge. In order to accurately describe the visit length, the time in clinic was defined as the time the patient was checked into the clinic by admissions staff or visit start until the time the nurse prints the after visit summary (AVS), which is handed to and reviewed with the patient immediately prior to discharge. This was determined to be the most accurate proxy for visit end as closing the chart or signing the chart can take place hours or days after patients have been seen in the clinic. Change in pain scores was calculated by subtracting the pain score at the time the first set of vital signs is collected from a pain reassessment at the end of the visit. Opiate pain reliever data were described as yes or no in either the pre-hospital setting, during the visit, or at discharge. Data on the amount of opiate was not analyzed.

### **Data Collection Plan**

Data were collected from the Burn Registry and the EPIC EHR. The data were then compiled in Excel, examined for errors and missing entries. Patient vital signs, pain scores, and admission data were collected by hand and entered in the Excel file. Revenue

data was obtained from the hospital information technology department. Demographic data were obtained from the burn registry. Visit length, vital signs, and opiate prescribing data were extracted from the electronic health record (EHR). Since the data were obtained exclusively from the EHR, this minimal risk study meets exempt status by the IRB. All components of the study were approved by the hospital and university institutional review boards for the protection of human subjects.

### **Data Analysis**

The Statistical Package for Social Sciences (SPSS) Version 26 was used to analyze the data. The data were collected by a single individual and entered into an Excel spread sheet, coded, and an SPSS database was created for analysis. Descriptive statistics were used to examine the variability within the data. Independent *T*-tests were used to examine continuous variables, Chi-square analysis was used to examine categorical variables. Mean pain scores were examined using ANOVA between patients seen by physicians and those seen by APNs. A secondary examination of revenue generated during the study period was compiled by the hospital IT department using Excel.

### **Summary and Significance**

Burn injuries require immediate evaluation and treatment. Delaying care can result in prolonged pain and in the event of a chemical burn, worsen the severity of the injury. Multiple studies have shown that the care provided by APNs is equivalent to that of physicians in a variety of settings although no RCTs have been conducted which would support this assertion. To date, no studies had been done in burn clinics leaving a gap in the knowledge. This study was designed to further inform that knowledge deficit.

## **Chapter IV**

### **RESULTS**

The results presented in this chapter include a descriptive profile of the sample, followed by results related to the specific aims and research questions.

#### **Participants**

Participants for this study were patients presenting to the overnight burn clinic at the regional burn center of a Level 1 trauma center in southern California during the time period October 1, 2015 to November 30, 2019, resulting in 527 cases. All patients seen between the hours of 6 PM and 6 AM during the 4 year study, who meet criteria to be seen in the burn clinic, were included in the analysis.

#### **Analyses**

All variables were analyzed for 527 cases. Descriptive statistics were used to measure frequency and measures of central tendency. Spearman and Pearson correlations were used to describe the bivariate relationships between categorical variables and the single continuous variable, minutes in clinic. Independent samples t-tests were conducted to identify whether there was a statistical difference in the means between those seen by physicians versus those seen by APNs.

#### **Aim 1**

Aim 1: To describe the demographic (age, gender, ethnicity) and clinical variables (time in clinic, pain, provider type) of patients seen in the overnight burn clinic. Five hundred twenty-seven cases were examined from the burn registry. The mean age of the patients was  $26.7 \pm 21.2$  years. There were more males (n=306) than females (n=221) in the group. Approximately three-quarters (73.8%) of the patients were either

white (n = 221, 41.9%) or Hispanic (n=168, 31.9%). Table 1 summarizes sample characteristics for the 527 patients.

Table 1.

Demographics Characteristics Burn Patients

Characteristic	n	%
Age Mean (SD)	26.7±21.2	
Gender		
Male	306	58.1
Female	221	41.9
Ethnicity		
Asian	18	3.4
Black	32	6.1
Hispanic	168	31.9
White	221	41.9
Other	81	15.4
Missing	7	1.3

## Aim 2

Aim 2: Examine the relationships among demographics (age, gender, ethnicity), provider type, pain scores, opiate prescribing data, specialist consult, and time in the clinic for this cohort of patients. Bivariate correlation was conducted to identify significant relationships between the study variables and patient

characteristics. Independent samples t-tests were completed to compare means for provider type with demographic and clinical variables. The majority of the data was categorical with time in clinic being continuous.

No difference in outcomes between provider type and clinical variables, no significant differences were detected between provider type and pain scores, opiates prescribed during or after the visit.

Table 2.

Clinical Variables Burn Patients

	Resident		APN		t	P
	Mean	SD	Mean	SD		
Time in clinic	86.7	55.42	71.28	41.44	490	.008
Pain score	1.61	2.65	2.79	9.76	403	.63
Opiate in clinic	.51	.50	.53	.50	492	.52
Opiate at discharge	.30	.46	.30	.46	492	.84

The patients seen by a resident (n = 114) compared to the patients seen by APNs (n = 413), demonstrated a significantly shorter visit length for those seen by APNs,  $t(490) = 2.97$ ,  $p = .008$ . There was no significant effect for first pain score,  $t(403) = -1.1$ ,  $p = .63$ , last pain score  $t(271)$ ,  $p = .17$ , having an opiate administered in clinic  $t(492) = -.47$ ,  $p = .54$  or having an opiate prescribed at discharge  $t(492) = -.10$ ,  $p = .84$

### **Aim 3**

Identify factors that are associated with the variance in the time spent in the clinic. Although planned, a linear regression was not performed to describe the variability in the

dependent variable (time in clinic) with the independent variables (age, ethnicity, gender, provider, disposition); bi-variate analysis did not identify needed statistical significance for variables to enter the model.

### Supplemental Analysis

A supplemental analysis was conducted to answer the following question: Was there a difference in whether a patient was given an opioid pain medication prior to arrival in the clinic based on ethnicity? A crosstabs calculation was conducted revealing differences in the expected vs actual who received opioid pain medication by ethnicity. Numerically fewer black and Hispanic patients received opiate pain medications prior to arrival at the hospital. The results were not statistically significant using a chi-squared analysis.  $\chi^2 = 9.75 (4)$ ,  $p = .045$ . There were no statistical differences in opiate prescribing either during the visit or at discharge between resident physicians and APNs. Having an opiate administered in clinic  $t(492) = -.47$ ,  $p = .54$  or having an opiate prescribed at discharge  $t(492) = -.10$ ,  $p = .84$

Table 3.

### Supplementary Analysis

		Asian	Black	Hispanic	Other	White	Total
Opiate given pre-clinic	No	2.3%	4.8%	23.3%	9.3%	25.8%	65.5%
		n = 12	n = 25	n = 120	n = 48	n = 133	n = 338
	Yes	1.2%	1.2%	9.1%	6.4%	16.7%	34.5%
		n = 6	n = 6	n = 47	n = 33	n = 87	n = 178

## Secondary Analysis

Research question: Was there a difference in revenue generated by APNs as compared to resident physicians?

Resident physicians do not bill for their services, instead, patients are charged a general facility fee for their visit. APNs do bill for their services and the aim of this research question was not to determine if there would be a difference, that was a foregone conclusion, but to assess how much of a difference in revenue was generated during the year prior to and the year after implementation of the transition. The hospital clinical informatics specialists were provided with the same visit data used in the previous analysis and pulled the per visit revenue and total revenue generated during the time period. There was a dramatic increase in per visit revenue and total revenue generated over the time period.

Table 4.

### Total Growth in Revenue

Summary	Total Growth %
Charges, Year over Year	576%
Encounters, Year over Year	151%
Charge per Encounter, Year over Year	169%

## **Summary**

This analysis supports the body of evidence that care provided by physician residents and APNs is not statistically different on measures of pain management, opiate prescribing both during the visit and at discharge. There was inconclusive data generated on admission rates and referral to specialty services due to the low number of cases identified. A significant difference in the number of minutes spent in the clinic and revenue generated by APNs highlights the value APNs contribute to operational efficiency and revenue generation. In this particular institution, as a teaching hospital, patients seen overnight were not billed for provider services beyond a general facilities charge prior to the transition to APN coverage which occurred on October 1, 2016. This creates a unique situation because the increase in revenue seen when APNs began to see the patients, masks the benefit seen on the patient side. In a setting where physicians bill for their services, the cost to the patient could be lower when seen by an NP. In an environment where the true cost of delivering services is artificially reduced by the use of resident physicians, utilization of APNs does indeed appear to increase costs for the patient. The significance meaning of this analysis will be discussed in Chapter 5.

## Chapter V

### DISCUSSION AND FINDINGS

The purpose of this retrospective descriptive comparative design study was to describe the difference in visit length, pain scores, opiate prescribing practices and per patient revenue between patients cared for in an overnight burn clinic by APNs compared to resident physicians. Visit length in minutes was the primary outcome measure. Pain scores and the difference in pain scores at the beginning and end of the visit were examined. Opiates given prior to the visit, during the visit, and at discharge were examined. A secondary measure of revenue generated per patient was also examined. In this chapter a discussion of the findings, strengths, limitations, and implications for nursing practice is undertaken. Recommendations for future research is discussed.

#### **Study Summary**

Data on 527 subjects were obtained for patients seeking care in a regional burn center overnight clinic at a level 1 Trauma center in southern California. Cases seen between the hours of 6pm and 6am were obtained from the burn registry, a data set collected by the Burn Center, which is then transmitted to the American Burn Association which aggregates it into a national database available for research. Each unique visit was then identified in the EHR and examined to see if the case met the study criteria. Visits meeting criteria were then further examined and data regarding vital signs, provider type, pain scores, specialist consult, and opiate prescribing were collected. The time period covered by the study was from October of 2015 through November of 2019. Active chart examination occurred over a 24-month period. Each chart was accessed, and data extracted from the burn registry database was compared to the actual chart for accuracy.

Descriptive, inferential, and multivariate analysis was conducted for each of the research aims.

### **Study Findings**

Extant studies have found little to no difference in the care delivered by physicians and APNs. (McCleery, Christensen, Peterson, Humphrey, & Helfand, 2011; Naylor & Kurtzman, 2010; Pioro et al., 2001; Roche, Gardner, & Jack, 2017; Spetz, Skillman, & Andrilla, 2017). In that regard, this study supports that finding. The transition to APN coverage from physician resident coverage was envisioned as a way to address a perceived extended wait time for patients presenting to the burn clinic prior to being seen and treated. This study supports the decision to make the transition by identifying a statistically significant reduction in visit length over the period of study. Regarding the ability to generalize these findings to other settings must take into account the ethnic makeup of the population involved in the study. The population in southern California is more diverse than the nation as a whole. The proximity to the border with Mexico and the long history of immigration to California is reflective of the diversity of the patients seen in the clinic.

### **Conceptual Framework**

The refined quality health outcomes model, which builds on the work of Donabedian's structure process outcomes model, was used as the conceptual framework for this study. As a middle range theory, it helps to describe the interplay between the health system structure, the process of healthcare delivery, and the changeable and unchangeable client characteristics examined in this study. The results of the study can be described in terms of the conceptual framework as envisioned by Radwin (2002).

Structural changes implemented during the time of this study included re-aligning the work responsibilities of APNs on the surgical service in order to provide overnight coverage in the Burn Clinic. Each of the providers was trained during a two month period immediately preceding the transition which occurred on October 1, 2016. Attending physicians were available for consultation at all times. Billing privileges were put in place coinciding with the transition day. Changes in call schedules, resident coverage responsibilities, workflow changes for APNs and staff education regarding the transition were disseminated. Process changes included having APNs prioritize the burn clinic patients over other non-critical tasks. Client state characteristics, those which change based on the structure and process changes were examined separately from client trait characteristics as described in the conceptual framework. Client state characteristics examined were pain scores, changes in pain scores, heart rate, blood pressures, admission rates, need for pain medications and specialist consultations. Client trait characteristics examined were gender, age and ethnicity. Interventions examined were divided by provider type and outcomes were compared. The primary outcome evaluated was whether there was any bidirectional change in the number of minutes spent in the clinic along with the other client state characteristics by provider seen. Then, an examination of the effects of unidirectional client trait characteristics on interventions, outcomes and system changes were evaluated by provider seen. No differences were detected in measures of client state by provider seen and no differences in provider practices based on client traits were revealed. A significant difference in the number of minutes in the clinic by provider seen supports the system changes envisioned prior to the start of the study. The secondary aim characterized the changes in revenue seen following the

system changes implemented during the year prior to and after the transition day. Each of the components of Radwin's (2002) modifications to the QHOM conceptual model support the structure and analysis undertaken in this study. Burn clinic patients spend less time in the clinic when seen by an APN with no statistical difference in measures of pain, vital signs or opiates prescribed either during the visit or at discharge not affected by age, ethnicity or gender.

### **Limitations**

This study has several limitations. The design of this study was a retrospective descriptive comparative design. Data prior to 2015 is not available, limiting the number of patients seen by resident physicians (n= 108) to one year prior to the transition to APN coverage. Familiarity with burn treatment regimens and provider comfort levels initiating the treatment could account for the differences seen in visit length. Resident physicians rotate on a 4-week schedule at this institution, which may affect visit length as they learn the daily routine of the clinic or become familiar with burn treatments and process. There have been no changes in APNs who staff the burn clinic overnight and increasing comfort and confidence with the patients presenting with burns may have had an effect on visit length. Each provider has subtle differences in how they describe burn wounds, document what was done including medications administered, and discharge medications in the EHR. Not every provider documents handwritten opioid prescriptions in the same way at discharge. Some data may have been lost due to incomplete documentation. If a prescription for opioids was transmitted electronically it would be documented in the EHR. This ability to send controlled substance electronic prescriptions came about during the time period of the study and has been adopted by

some providers and not by others. The most frequent method of providing a controlled substance prescription is by a handwritten script on a controlled substance pad. Verbal reports of pain and changes in pain are difficult to measure empirically; 58.4% of patients had pre and post debridement pain scores documented in the EHR. This excluded 41.6% of the cases further weakening the meaning of the data. Pain perception is subjective and has a great deal of variability from person to person. Severity of the burn injury was not examined in this study as it relates to pain. Less severe burns tend to be extremely painful where much deeper injury with damage to the nerves can be described as not painful or minimally painful. While there may be some numeric differences in reported changes in pain, for practical purposes a 1 or two-point difference in pain has no clinical meaning.

### **Implications for Practice**

Having dedicated providers who are able to prioritize seeing patients who have been burned is multifactorial. Early treatment of burns can lessen severity in the case of chemical burns, early pain management can alleviate suffering (Morgan et al. 2018). Changes in the structure or process of delivery of specialized burn care allowing for quicker review should be welcomed (Kelly et al. 2013). In this institution, APNs have been tasked with making burn clinic patients a priority in order to expedite their care. This also frees up the resident physicians to dedicate their time to more pressing tasks, which further their learning and education as surgeons. Examining the revenue improvements of this transition proved to be dramatic. In the two-year time period of the revenue comparison, a 169% increase was realized highlighting the need to bill for provider services when possible which supports the ongoing vitality of the clinic and

justifies its existence and the jobs it supports. Patients could be seen in the Emergency Department, but the advantages of being seen by a provider and nurses with specialty training would be lost.

### **Implications for Health Policy**

In keeping with the need for future planning and the development of healthcare systems in line with the workforce planning model (WPM) jointly developed with the American Hospital Association, American Society for Healthcare Human Resources Administration, and the American organization of Nurse Executives, studies which help inform the four components of WPM with the goal of ensuring competent and sufficient numbers of healthcare providers are of benefit. Collecting data, understanding the workforce, and using the results will help the organization better understand its current and future needs. As the healthcare landscape changes and evolves, who to hire, how jobs are performed, and how patient care is delivered will help organizations better understand their needs (American Organization for Nursing Leadership (AONL), 2013).

The study supports the move toward NP run clinics on multiple fronts. Residents who previously would have been pulled away from more pressing issues in order to evaluate and treat minor burn patients are able to more fully focus on treating more critically ill patients. As this study identifies, tasking the APNs with patients in the burn clinic benefits the patients with shorter visit length, more timely treatment, and the benefit of having a provider with what is now years of experience dealing with burn injury. From an organization standpoint, improvements in revenue due to the ability of APNs to bill for their services helps to support and fund the continuing presence of a 24 hour staffed clinic.

## **Future Research**

This study reinforces what multiple previous studies have shown. APNs provide care, which is not different from the care provided by physician residents. No previous studies have been undertaken in this quasi-acute care type clinic environment and none comparing burn care specifically. Further research on the revenue generating abilities of APNs in teaching institutions is warranted. This study did not show a significant difference in the number of patients prescribed opioid pain medications in the pre-clinic environment. However, there were numerically fewer Black and Hispanic patients who received opioid pain medications prior to arrival at the clinic and numerically more whites receiving opioid pain medications prior to arrival than what was predicted. Further studies are indicated to examine whether there is a difference in treatment in the community breaking along racial lines. Visit lengths were shorter with APNs during the period of this study. Additional research in different clinic environments could either reinforce or call into question what was found in this study. As legislation advances nationally, allowing APNs to practice to the full extent of their training, studies comparing the care APNs provide to existing practice will help to advance changes in health policy.

## **Conclusion**

Burns are dynamic and evolving wounds (Morgan et al., 2018). This study has shown, burn care is dynamic and evolving as well. Faster treatment and pain relief in a non-biased environment by specially trained providers has incrementally improved care provided to these vulnerable patients. The increase in revenue supports the important role APNs play in the delivery of health care in a modern health system. Much work

remains to be done. Burn management relies heavily on the use of opiate pain medications during the first days following the injury. Future work examining the quantities of opiate pain medications or the use of multimodal pain regimens to manage burn pain would be informative and build on the body of knowledge necessary to effectively treat these wounds. Epidemiologic work regarding neighborhoods with a higher proportion of burn clinic patients can help to target outreach within these populations. Incremental improvements in burn management will advance the treatment modality and improve patient outcomes.

## REFERENCES

- Agency for Healthcare Research and Quality. (2012, September). *Primary Care Workforce Facts and Stats No. 3*. [Text]. AHRQ. Retrieved from <https://www.ahrq.gov/research/findings/factsheets/primary/pcwork3/index.html>
- American Association of Nurse Practitioners. (2020, March 3). *More Than 290,000 Nurse Practitioners Licensed in the United States*. AANP. Retrieved March 18, 2020 from <https://www.aanp.org/news-feed/290-000-nps-licensed-in-us>
- American Association of Occupational Health Nurses. *AAOHN : Position Statements*.(n.d.). AAOHN. Retrieved April 20, 2019 from <http://aaohn.org/page/position-statements>
- American Organization for Nursing Leadership. (2013). *Developing an Effective Health Care Workforce Plan*. [White Paper]. Retrieved from <https://www.aonl.org/sites/default/files/aone/workforce-planning-model.pdf>
- Donabedian A. 1973. *Aspects of Medical Care Administration: Specifying Requirements for Health Care* Cambridge, MA: Harvard University Press
- Endorf, F. W., & Dries, D. J. (2011). Burn resuscitation. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 19, 69–69. <https://doi.org/10.1186/1757-7241-19-69>
- Flynn, B.C. (1997). Partnerships in healthy cities and communities: A social commitment for advanced practice nurses. *Advanced Practice Nursing Quarterly*, 2(4), 1–6.

- Guzik, A., Menzel, N.N., Fitzpatrick, J., & McNulty, R. (2009). Patient satisfaction with nurse practitioner and physician services in the occupational health setting. *AAOHN Journal*, 57(5), 191–197. <https://doi.org/10.3928/08910162-20090428-06>
- Hunt, L. M., & Megyesi, M. S. (2008). The ambiguous meanings of the racial/ethnic categories routinely used in human genetics research. *Social science & medicine (1982)*, 66(2), 349–361. <https://doi.org/10.1016/j.socscimed.2007.08.034>
- Kelly, J., Nikkiah, D., Wek, C., & Dheansa, B. (2013). Changing management models in burn care. *British Journal of Healthcare Management*, 19(12), 585–589. <https://doi.org/10.12968/bjhc.2013.19.12.585>
- Kippenbrock, T. (2017). Nurse Practitioner Leadership In Promoting Access to Rural Primary Care. *Nursing Economic\$, 35(3)*, 119–125.
- Knickman, J. R., Lipkin, M. J., Finkler, S. A., Thompson, W. G., & Kiel, J. (1992). The potential for using non-physicians to compensate for the reduced availability of residents. *Academic Medicine*, 67(7), 429–438.
- Mayberry, L.J., & Gennaro, S. (2001). A quality of health outcomes model for guiding obstetrical practice. *Journal of Nursing Scholarship*, 33(2), 141–146. <https://doi.org/10.1111/j.1547-5069.2001.00141.x>
- McCleery, E., Christensen, V., Peterson, K., Humphrey, L., & Helfand, M. (2011). Evidence Brief: The Quality of Care Provided by Advanced Practice Nurses. In *VA Evidence-based Synthesis Program Evidence Briefs*. Department of Veterans Affairs (US). <http://www.ncbi.nlm.nih.gov/books/NBK384613/>

- Mitchell, P. H., Ferketich, S., & Jennings, B. M. (1998). Quality health outcomes model. American Academy of Nursing Expert Panel on Quality Health Care. *Image--the Journal of Nursing Scholarship*, 30(1), 43–46.
- Morgan, M., Deuis, J. R., Frøsig-Jørgensen, M., Lewis, R. J., Cabot, P. J., Gray, P. D., & Vetter, I. (2018). Burn Pain: A Systematic and Critical Review of Epidemiology, Pathophysiology, and Treatment. *Pain Medicine*, 19(4), 708–734.  
<https://doi.org/10.1093/pm/pnx228>
- Mundinger, M. O. (1994). Advanced-Practice Nursing—Good Medicine for Physicians? *New England Journal of Medicine*, 330(3), 211–214.  
<https://doi.org/10.1056/NEJM199401203300314>
- Naylor, M. D., & Kurtzman, E. T. (2010). The Role Of Nurse Practitioners In Reinventing Primary Care. *Health Affairs*, 29(5), 893–899.  
<https://doi.org/10.1377/hlthaff.2010.0440>
- Newhouse, R. P., Stanik-Hutt, J., White, K. M., Johantgen, M., Bass, E. B., Zangaro, G., Wilson, R. F., Fountain, L., Steinwachs, D. M., Heindel, L., & Weiner, J. P. (2011). Advanced practice nurse outcomes 1990-2008: A systematic review. *Nursing Economic\$,* 29(5), 230–250; quiz 251.
- Oliver, R. (2019, August 20). *Burn Resuscitation and Early Management: Historical, Pathophysiology, Initial Evaluation and Treatment*. Medscape. Retrieved from <https://emedicine.medscape.com/article/1277360-overview>
- Pioro, M. H., Landefeld, C. S., Brennan, P. F., Daly, B., Fortinsky, R. H., Kim, U., & Rosenthal, G. E. (2001). Outcomes-based trial of an inpatient nurse practitioner

- service for general medical patients. *Journal of Evaluation in Clinical Practice*, 7(1), 21–33. <https://doi.org/10.1046/j.1365-2753.2001.00276.x>
- Polit, D.F. and Beck, C.T. (2012) *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. 9th Edition, Lippincott, Williams & Wilkins, Philadelphia.
- Radwin, L. (2002). Refining the quality health outcomes model: Differentiating between client trait and state characteristics. *Nursing Outlook*, 50(4), 168–169. <https://doi.org/10.1067/mno.2002.127471>
- Roche, T. E., Gardner, G., & Jack, L. (2017). The effectiveness of emergency nurse practitioner service in the management of patients presenting to rural hospitals with chest pain: A multisite prospective longitudinal nested cohort study. *BMC Health Services Research*, 17, 1–14. <https://doi.org/10.1186/s12913-017-2395-9>
- Sharples, L. D. (2002). A randomised controlled crossover trial of nurse practitioner versus doctor led outpatient care in a bronchiectasis clinic. *Thorax*, 57(8), 661–666. <https://doi.org/10.1136/thorax.57.8.661>
- Spetz, J., Skillman, S. M., & Andrilla, C. H. A. (2017). Nurse Practitioner Autonomy and Satisfaction in Rural Settings. *Medical Care Research & Review*, 74(2), 227–235. <https://doi.org/10.1177/1077558716629584>
- Stanik-Hutt, J., Newhouse, R. P., White, K. M., Johantgen, M., Bass, E. B., Zangaro, G., Wilson, R., Fountain, L., Steinwachs, D. M., Heindel, L., & Weiner, J. P. (2013). The Quality and Effectiveness of Care Provided by Nurse Practitioners. *The Journal for Nurse Practitioners*, 9(8), 492-500.e13. <https://doi.org/10.1016/j.nurpra.2013.07.004>

- Thompson, R. S., Basden, P., & Howell, L. J. (1982). Evaluation of initial implementation of an organized adult health program employing family nurse practitioners. *Medical Care*, 20(11), 1109–1127. doi:10.1097/00005650-198211000-00006
- U.S. Census Bureau. (2011). *Statistical Abstract of the United States: 2012*. 62. Retrieved from <https://www.census.gov/library/publications/2011/compendia/statab/131ed.html>
- Weiland, S. A. (2015). Understanding nurse practitioner autonomy. *Journal of the American Association of Nurse Practitioners*, 27(2), 95–104. <https://doi.org/10.1002/2327-6924.1212>

APPENDIX A

USD Institutional Review Board Approval