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PLASTIC SURGERY RESIDENT PERCEPTIONS OF THE ACCREDITATION COUNCIL FOR GRADUATE MEDICAL EDUCATION’S 2011 DUTY HOUR REGULATION CHANGES: ARE PATIENTS AT RISK?

By
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A DISSERTATION

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Abstract

The death of Libby Zion, a New York City college student, in 1984 was blamed in part on fatigued and under-supervised residents. Her death brought about a grand jury investigation and eventually prompted the Accreditation Council for Graduate Medical Education (ACGME) to create and enforce multiple duty hour regulations for residents throughout the United States since that time. The ACGME last made changes to its duty hour regulations on July 1, 2011. These changes were more stringent than previous regulations and may affect patient safety. Little research exists concerning the new regulations’ effects on patient safety, and hardly any research focuses on residents’ perceptions of duty hour regulations and patient safety. While internal medicine and other medical residents have been studied, plastic surgery residents have largely been ignored. Therefore, the purpose of this ethnographic study was to describe plastic surgery residents’ perceptions of the ACGME’s 2011 duty hour regulations’ effects on patient safety. Ten plastic surgery residents were interviewed to determine their perceptions of the 2011 duty hour changes and patient safety. Fourteen questions were used to guide each interview. Interviews were transcribed, and transcripts were checked for accuracy. Open and axial coding was used to separate and organize data into themes. Five themes emerged regarding patient safety, which were resident fatigue, resident inexperience, patient hand-offs, at-home call, and night float. Information gained from this study may aid the medical community when considering future changes for resident duty hour regulations.

Keywords: ACGME, Duty Hour Regulations, Plastic Surgery Residents, Patient Safety
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CHAPTER ONE: INTRODUCTION

Background of the Problem

Libby Zion was a freshman in college when she was brought to a teaching hospital in New York City in 1984. She had a medical history of depression and was seen for flu-like symptoms and a high fever. Young residents in their first and second years of training provided care to Libby in the emergency room without an attending physician, and she passed away only a few hours after being admitted to the teaching hospital. Her death was initially blamed upon a serious infection, but it is now known that she died of serotonin syndrome, which was caused by the improper administration of two common psychiatric medications (Philibert & Taradejna, 2011).

Libby’s father was a well-known and well-respected newspaper writer and believed his daughter’s death was caused in part by over-worked and under-supervised residents. He used his connection to the press to bring about a grand jury investigation. This 1986 investigation found that Libby’s death was partly caused by the fact that residents caring for her had worked for at least 36 hours with no break. They were fatigued. Her death was also blamed on a lack of supervision from attending physicians. The result of the grand jury investigation was a call for more regulated duty hours, more resident supervision, and the formation of an advisory committee for resident work hours. This advisory committee eventually recommended an 80-hour maximum workweek and a 24-hour maximum shift length for all medical residents in the United States to aid in avoiding fatigued residents. It also recommended that attending physicians should be required to be present in teaching hospitals at all times (Philibert & Taradejna, 2011).
Such recommendations and pressure from the public have led to multiple changes in resident duty hours over the past few decades and close oversight from the Accreditation Council for Graduate Medical Education (ACGME). The ACGME is the governing body for medical residency programs and fellowships in the United States. Each time duty hour regulations have been changed, requirements have become more stringent for teaching institutions and may have affected patient safety.

A substantial amount of quantitative, qualitative, and mixed methods research has been conducted on the subject. Over the years, multiple and conflicting findings concerning resident duty hours, fatigue, and patient safety have emerged: 1) More strict duty hour regulations lead to greater patient safety; 2) More strict duty hour regulations have little to no effect on patient safety; and 3) More strict duty hour regulations lead to decreased patient safety (Babu, et al., 2014, Browne, et al., 2009, Maughan, Lei, & Cydulka, 2011, Pasupathy & Barker, 2012, Rosen, et al., 2009, & Volpp, et al., 2007).

**Statement of the Problem**

The ACGME changed its rules regarding resident duty hours most recently in July of 2011. These changes were again more stringent and intended to encourage resident well-being and patient safety. These changes were aimed at controlling maximum duty period lengths, maximum in-hospital on-call frequency, minimum time off between scheduled duty periods, and maximum frequency of in-hospital night float periods, especially for residents in their early years of training. Residents in their first years of training often lack general medical knowledge and are more likely to make medical errors (Desselle & Dawkins, 2014). Although much research has been conducted on previously implemented duty hour rules and their effects, little research currently exists
regarding the ACGME’s 2011 changes. Specifically, little research exists concerning how medical residents perceive the new rules have affected patient safety. More specifically, little research exists concerning the perceptions of plastic surgery residents, one of many surgical specialties.

**Purpose of the Study**

The purpose of this ethnographic study was to describe the perceptions of plastic surgery residents regarding the ACGME’s 2011 duty hour regulations as they relate to patient safety at a Midwest academic medical center.

**Research Question**

Each time the ACGME makes changes to its duty hour regulations, resident physicians have opinions regarding regulations’ effects on patient safety. The following research question guided this qualitative study.

How do plastic surgery residents believe the ACGME’s 2011 duty hour regulations have affected patient safety?

**Method Overview**

This study was an ethnographic, qualitative study. Information regarding residents’ perceptions of the 2011 regulations’ effects on patient safety was collected using recorded personal interviews with ten plastic surgery residents. A set of 14 questions was used to guide each interview. Plastic surgery residents working at a Midwest academic medical center were interviewed, and their responses were electronically recorded and transcribed verbatim. Once transcribed, information was checked for accuracy and analyzed thematically.
Definition of Terms

The field of graduate medical education uses many standard terms to define roles, levels of education, and patient safety. The following terms were used operationally within this study:

**Accreditation Council for Graduate Medical Education (ACGME):** the governing body of American medical residency and fellowship programs headquartered in Chicago, Illinois

**At-Home Call:** call period when residents are allowed to leave the hospital but must be available to take calls and questions and be able to quickly return to the hospital to provide patient care

**Attending Physicians:** physicians who have completed medical school training and residency training required for their fields and are usually board certified in a medical specialty

**Call:** a time period when residents are expected to be available to provide patient care, usually includes hours after normal business hours through the next morning to business opening, and can be in-house (hospital) call or at-home call

**Designated Institutional Official (DIO):** individual who oversees all ACGME-accredited residency programs at any given teaching institution

**Duty Hour Regulations:** rules set forth by the ACGME to limit the number of hours residents in training may work in a given time period

**Hand-Off:** the transfer of patient care from one provider to another, usually at the end of a shift or duty period
In-House Call: call period when residents are not allowed to leave the hospital and are expected to provide patient care immediately

Interns: physicians who have completed medical school and are in the process of completing an additional year of clinical training prior to entering residency training

Medical Errors: errors that occur when a planned medical action is not completed as intended or an incorrect plan is used for medical treatment, may include such elements as adverse drug events, surgical injuries, falls, burns, pressure ulcers, and incorrect patient identification (Institute of Medicine, 1999)

Night Float: time period or rotation when residents are expected to work a non-traditional, night schedule and handle hospital admissions

Plastic Surgery: surgical procedures used to restore form and function to the human body and can be either reconstructive or cosmetic in nature

Postgraduate Year (PGY): classification system used to differentiate medical interns and residents based on their level of training following the completion of medical school (PGY 1-PGY 6 for plastic surgery residents), salary and level of responsibility usually increase as PGY classification increases

Residents: physicians who have completed medical school training and are currently completing required clinical training for their fields, have usually completed an internship and are employed by sponsoring organizations

Assumptions

The following conditions were assumed to be true for this qualitative study.

Study participants answered interview questions honestly based upon their personal
experiences. Study participants answered interview questions openly and honestly without fear of retaliation, academic consequences, or breach of confidentiality.

**Delimitations and Limitations**

**Delimitations**

The following delimitations existed for this qualitative study. Only plastic surgery residents were included in the study, one of many different surgical specialties. Only plastic surgery residents practicing at a single academic medical center were included in the study. Only plastic surgery residents with at least one year of experience in their current position were included in the study so as to yield accurate information based on actual experiences.

**Limitations**

Certain limitations also existed for this qualitative study. First, current patient loads may have affected resident responses. The number of patients being cared for at any one time may have affect resident work hours. Residents may have worked more hours if there were more patients receiving care on their service. They may have also spent less time treating and communicating with each patient. Therefore, residents may have exhibited different perceptions of duty hour regulations and patient safety than they would have when patient loads were lighter and vice versa.

Next, patient populations may have affected resident responses. The location of the academic medical center in this study may have exhibited different patient populations than other teaching institutions. For example, residents working in urban settings may care for more patients of a low socio-economic status. These patients may also exhibit multiple and more complex health issues than those at other institutions.
Therefore, residents working in an urban setting may have provided different answers regarding duty hour regulations and patient safety than residents working in a suburban or rural area.

Specific rotations may have also affected resident responses. During the course of resident training, residents are often exposed to different specialties or services. For example, plastic surgery residents may rotate through general surgery, dermatology, emergency room, and burn units. Each rotation may present different work hours, patient loads, disease complexities, faculty expectations, and patient populations, all of which may have affect resident responses when asked about duty hour regulations and patient safety.

Finally, the studied institution may or may not have strictly followed the ACGME’s most current duty hour regulations set forth in 2011. Program directors and faculty members may have created differing work environments. In some cases residents may have been required to strictly adhere to the ACGME’s current regulations, while regulations may have been ignored in other cases. Therefore, different environments and adherence levels may have affected resident responses.

**Significance of the Study**

Libby Zion’s untimely death showed that fatigued and under-supervised medical residents in training could harm patients. They ultimately could kill patients. As a result, the ACGME has continually changed its duty hour regulations in the name of resident well-being and patient safety, making regulations more stringent each time. Fewer work hours and more supervision have commonly been required by the ACGME. Past research has shown that some of these changes have improved patient safety, and some
have had little to no effect. Unfortunately, other changes have actually led to decreased patient safety (Babu, et al., 2014, Browne, et al., 2009, Maughan, Lei, & Cydulka, 2011, Pasupathy & Barker, 2012, Rosen, et al., 2009, & Volpp, et al., 2007).

Since the ACGME’s latest changes were only implemented in late 2011, little research has been conducted regarding these rules and their effect on patient safety. Specifically, little information exists concerning actual residents’ perceptions of the 2011 regulations’ effect on patient safety, including residents in the plastic surgery specialty. Most research concerning resident perceptions has been in the form of written surveys. Researchers have failed to conduct in-depth interviews with residents. As a result, the medical profession remains largely uninformed of residents’ perceptions of the regulations’ effects on patient safety. The profession cannot tolerate regulations that have little to no effect on patient safety or regulations that may actually compromise patient safety and lead to more cases like that of Libby Zion. Therefore, more research is necessary to examine the effectiveness of the 2011 changes and to make recommendations to the ACGME for changes to the rules in the years to come.

**Summary**

Libby Zion’s death in a New York City hospital in the 1984 caused the ACGME to mandate multiple duty hour regulation changes over the past 30 years. Prior research has shown that these mandates have positively affected patient safety in some cases, have had little to no effect on safety, and have negatively affected patient safety (Babu, et al., 2014, Browne, et al., 2009, Maughan, Lei, & Cydulka, 2011, Pasupathy & Barker, 2012, Rosen, et al., 2009, & Volpp, et al., 2007). The ACGME’s most recent changes were mandated in July of 2011. Little research exists concerning these newest regulations,
specifically in the plastic surgery field. Therefore, the purpose of this ethnographic, qualitative study was to describe the perceptions of plastic surgery residents with regard to these new regulations and patient safety. Personal interviews were conducted with plastic surgery residents to determine their thoughts on regulations and safety.
CHAPTER TWO: LITERATURE REVIEW

Introduction

Creighton University’s online library database and online search engines were used to search for scholarly, peer-reviewed journal articles relating to fatigue and workplace safety. Searches were not limited to the medical field. When in the medical field, searches were not limited to studies focused on attending physicians and residents. Nurses and other healthcare providers were included. Searches were limited to full online versions of scholarly articles and peer-reviewed information. Keywords such as “ACGME,” “attending physician,” “burnout,” “duty hour,” “duty hour regulation,” “fatigue,” “medical error,” “motor vehicle accident,” “nurse,” “patient safety,” “safety,” “sleep,” and “suicide” were used to search for information. In order to provide a more complete understanding of fatigue and safety issues in the workplace, literature was reviewed concerning the topics of the ACGME’s 2011 duty hour regulations, associated costs of the 2011 regulations, sleep science, and worker safety before exploring fatigue, duty hours and their effects on patient safety.

Background Information for the ACGME’s 2011 Duty Hour Regulations

Prior to 2011, the ACGME last made changes to its duty hour requirements in 2003. By 2008, the ACGME was ready to review the 2003 requirements and make necessary changes. This was due in part to a report released by the Institute of Medicine concerning duty hours, resident well-being and patient safety. Following the release of the Institute of Medicine’s report in 2008, the ACGME formed a 16-member taskforce to research the need for updated duty hour standards. Members of the taskforce were national physician leaders in graduate medical education, residents, and one individual
from the general public. The public member served as the voice of patients. Physician members included program directors, department chairs, and designated institutional officials from multiple residency programs and academic institutions in the United States. All three medical specialties were represented: medical, surgical, and hospital-based specialties. Task force members reviewed written statements and oral testimonies from stakeholders. They also conducted an extensive literature review and held fact-gathering sessions. The ACGME also conducted a survey of current residents, faculty, program directors, and designated institutional officials concerning the 2003 requirements and necessary changes, which was reviewed by task force members (Riebschleger & Nevin, 2011).

Several meetings were held with task force members and other stakeholders during the 2009-2010 academic year, including a Duty Hour Symposium and Duty Hour Congress. After reviewing all provided information, task force members were eventually able to create a draft of new duty hour regulations, which were posted on the ACGME’s website for 45 required days for public comment. The ACGME Board of Directors approved final revisions in September of 2010 after three years of research and analysis and implemented new regulations on July 1, 2011 (Riebschleger & Nevin, 2011). The 2011 duty hour regulations brought about many changes for teaching institutions in the United States and will be discussed further.

The 2011 Changes

The ACGME cites the safety of current patients and the safety of future patients under the care of newly trained doctors as its number one reason for making changes to duty hour policies in 2011. In addition, new duty hour regulations were meant to
promote resident well-being, provide a teaching environment conducive to learning with proper supervision, and to promote professionalism and responsibility amongst residents (Riebschleger & Nasca, 2011).

**Maximum Weekly Hours**

Regulations for the maximum hours worked by residents over the course of a week was left unchanged in 2011. Residents at all levels of training are still allowed to work 80 hours per week averaged over a four-week period (Desselle & Dawkins, 2013). Past studies viewed by the ACGME task force showed that residents consider a week of 76-82 work hours as ideal. Other studies have shown that medical exposure, academic performance, and general medical knowledge have remained constant when maximum hours are changed. The quality of medical care has also been unaffected (Riebschleger & Nasca, 2011).

**Maximum Duty Hour Period Lengths**

Maximum duty hour period lengths were shortened from 30 hours to 28 for most residents in 2011. Duty hour period lengths were further shortened to 16 hours for residents in their first year of training. The ACGME focused on residents in their first years of training due to findings that first year or PGY1 residents make more mistakes than those in their later years of training. This is most likely due to a lack of general medical knowledge and experience (Riebschleger & Nasca, 2011).

**Maximum In-Hospital On-Call Frequency**

Prior to 2011, residents were allowed a maximum in-hospital on-call frequency of every third night on average. Current rules only allow a maximum frequency of every third night with no averaging (Desselle & Dawkins, 2013). The task force reasoned that
the mental and physical effects of a call shift reach beyond the first day of recovery and necessitate the absence of averaging. However, some flexibility is provided to programs employing a small number of residents (Riebschleger & Nasca, 2011).

**Minimum Time Off Between Duty Hours Periods**

The regulation for minimum time off between scheduled duty hour periods became more complicated in 2011. Ten hours between shifts were previously required for all residents. Ten hours are now suggested for both first-year residents and intermediate residents, but only eight hours are required. Intermediate residents are required to receive a 14-hour break after 24 consecutive hours of in-house duty. Residents in their last year of training are left unregulated to a large degree (Desselle & Dawkins, 2013). It was reasoned that such requirements would allow sufficient recovery time for residents between shifts, while also allowing some flexibility for residents at more advanced levels of training (Riebschleger & Nasca, 2011).

**Night Float**

Residents are often required to perform night floats as part of their training, or to take hospital admissions after a certain, usually late hour. Night shifts have been shown to be more stressful and taxing than day shifts (Riebschleger & Nasca, 2011). In-hospital night float shifts were previously unregulated by the ACGME. However, as of 2011, such shifts are limited to six consecutive nights for all residents (Desselle & Dawkins, 2013).

**Mandatory Time Off**

Mandatory time off regulations were left unchanged in 2011. All residents are required to receive four days off per month and one day off per week averaged over a
four-week time period (Desselle & Dawkins, 2013). Mandatory transportation options and in-hospital sleep facilities are now required so residents may seek transportation assistance or sleeping quarters if they are too tired to safely drive home following a shift (Riebschleger & Nevin, 2011).

**Moonlighting & At-Home Call**

Moonlighting and at-home call were also addressed in 2011. Moonlighting, or practicing independently outside of one’s educational program, was banned from all first-year residents in 2011. In addition, all moonlighting hours are now required to be included in the 80-hour weekly maximum. Although at-home call requirements are not subject to the same frequency restrictions as in-house call, residents must log hours towards their weekly maximum if required to return to the teaching facility to perform work during these call periods (Riebschleger & Nasca, 2011).

**Cost of Regulation**

Tightened duty hour regulations can place significant financial strain on healthcare institutions, which are already experiencing financial strain brought about by increasing costs, uncompensated care, and decreasing Medicare and Medicaid reimbursements.

In a 2011 study, known costs associated with previous ACGME duty hour reforms were applied to the ACGME’s proposed 2011 changes. If implemented as the ACGME intended, the study estimated that the changes would cost almost $982 million across the United States. However, costs may be as much as $1.3 billion. Much of these additional costs will stem from job shifting to additional nursing staff members and mid-level providers (e.g., nurse practitioners and physician assistants). Increased costs may
also stem from requiring attending physicians to perform more work and the need to hire additional residents (Nuckols & Escarce, 2011).

One study focused specifically on replacing lost resident work with mid-level providers in orthopaedic training programs. In response to the 80-hour workweek implementation in 2003, many orthopaedic programs hired mid-level providers to cover the work residents once performed. Approximately 150 orthopaedic training programs were asked to complete an online survey in May 2010. Thirty-six programs responded and were responsible for training over 1,000 orthopaedic residents. Within these programs, the average resident’s workweek had declined by 5 hours, and over 140 new mid-level providers had been hired to cover resident duties. Applying this data to all orthopaedic training programs in the United States, researchers estimated that the combination of lost work hours and addition of mid-level providers cost orthopaedic training programs alone between $147 million and $208 million each year. Researchers also estimated that any further reductions in work hours would cost orthopaedic programs $8-$12 million per each reduced hour (Kamath, Baldwin, Meade, Powell, & Mehta, 2011).

Another study concerning costs in an urban, academic emergency room provides even more information regarding the costs of replacing resident work. In this particular academic setting, it was found that it cost $78.40 per patient seen if an attending physician only treated patients. This cost decreased to $74.91 if an attending and resident treated patients and was still only $78.32 if an attending physician and two residents treated patients. If mid-level providers replace residents, costs significantly rise. That is, costs become $77.67 per patient when one attending and one mid-level treat patients
compared to $74.91 with resident care. The costs lift to $83.01 for an attending and two mid-level providers compared to $78.32 for an attending physician and two residents (Sucov, Sidman, & Valente, 2009). Such costs add up quickly and will be difficult for many teaching institutions to cover.

Sleep

Acute Continuous Sleep Deprivation

Sleep is necessary to restore one’s body and mind. However, residents in training do not often receive enough sleep to effectively restore body and mind before returning to work. Mountain and colleagues summarized the four determinants of fatigue that may lead to impaired performance. The first determinant is acute continuous sleep deprivation. This may occur when a resident is required to perform work after an extended shift, such as overnight call. Effects on hand-eye coordination and the ability to hold attention are similar to that of alcohol impairment (Mountain, Quon, Dodek, Sharpe, & Ayas, 2007).

A 2011 study sheds light on the physiological effects just one night of sleep loss or acute sleep deprivation can have on the human body. This study was approved by the University of Lubech and involved a laboratory sleep study. Fourteen healthy males were randomly selected to participate. The study subjects were interviewed prior to the beginning of the study to ensure they received ample sleep in the weeks prior to the study. Two separate study sessions were used to study sleep patterns, blood work, heart rates, food consumption, and energy expenditures after forced acute sleep deprivation. After just one night of sleep deprivation, researchers found participants’ energy expenditures the morning after laboratory study significantly declined in comparison to
times of proper sleep. In addition, morning hunger was reported and an increase in food intake was recorded. It appeared that habitual sleep deprivation may lead to greater chances of contracting Type II Diabetes, as blood glucose levels were significantly higher in subjects following one night of study with deprivation (Benedict, et al., 2011).

**Chronic Partial Sleep Deprivation**

The second determinant of fatigue is known as chronic partial sleep deprivation. This occurs when residents receive some sleep hours, but they are not allowed or able to sleep as much as they need to or would in unlimited circumstances. Such a determinant has cumulative effects. Receiving six or less hours of sleep on a regular basis eventually equals the cognitive impairment of one night of no sleep or intoxication (Mountain, et al., 2007).

Lim and Dinges, researchers at The University of Pennsylvania, state that one in three adults in the United States suffer from sleep deprivation, which can lead to motor vehicle accidents, job-related accidents, and errors on the job. Many of these accidents can be attributed to a decrease in vigilant attention or concentration brought about by sleep deprivation. The Psychomotor Vigilance Test (PVT) has long been used to study sleep deprivation and vigilant attention. The PVT is a test of simple reaction time and only takes ten minutes to administer. Sleep-deprived subjects consistently exhibit increased reaction times, an increase in errors of omission and commission, and an increase of the time-on-task effect when taking the PVT. A slowing of reaction times simply means it takes longer for subjects to react to a stimulus when deprived of sleep. Errors of omission and commission can be defined as a lapse in or failing completely to respond to a specified stimulus in a timely manner. The time-on-task effect is noted
when an individual’s concentration decreases over the course of a cognitive task. This may be due to boredom or decreased motivation and is more often associated with higher cognitive demands (Lim & Dinges, 2008).

A 2010 review of studies conducted between 1950 and 2008 provided some information regarding the effects of limiting the length of duty hour shifts. Specifically, it provided information regarding the limitation of work shifts to 16 hours or less, which is the shift length recommended by the Institute of Medicine and now prescribed by the ACGME for residents in their early years of training. Two, independent researchers reviewed approximately 3,000 articles. Twenty-three articles were found to meet the researchers’ criteria. That is, the studies were peer-reviewed and consisted of original research, had been conducted at ACGME-accredited institutions, and contained both control and intervention study groups. It was found that reducing shifts to 16 hours or less did lead to a better quality of life for medical residents. In fact, eight of eight studies showed this. The review also showed that limiting work shifts improved patient safety and quality of care delivered. Seven of 11 studies showed improvement in patient safety, four of 11 showed no change, and no study presented a decrease in patient safety or quality. While both quality of life and patient safety improved, limiting shift hours also did not show any change in resident education traits. Medical education was not compromised (Levine, Adusumilli, & Landrigan, 2010).

**Circadian Effects**

Circadian effects are another determinant of fatigue. A circadian pacemaker is located in a part of the human brain known as the hypothalamus and sets an internal clock of approximately 24 hours. Essentially, the circadian pacemaker determines day and
night in human bodies. In this internal clock, a “performance nadir” is known to exist between 3:00 AM and 5:00 AM each day. If asked to perform work during this time, performance is usually impaired (Mountain, et al., 2007).

Although somewhat difficult to study, circadian rhythms are thought to affect performance in athletes. Therefore, knowledge of this determinant is important to players, coaches, trainers, and schedulers. It can be difficult to study athletic performance indicators and circadian rhythms because performance itself is difficult to define. Different performance indications are present in differing sports, and weather often plays a role in performance. However, it has been found that sensory, motor, and psychomotor skills, perceptual function, cognitive function, and simple reaction times are faster in the early evening hours when body temperature peaks. In contrast, motor control, mental arithmetic capabilities, and short-term memory have been found to be greater in early morning hours for soccer and tennis players. Flexibility, muscle strength, and short-term athletic performance all differ at different times of day as well. Therefore, it is recommended that those sports requiring much analysis and strategy be played in the morning hours for best performance results, and those requiring great physical strength be played later in the day (Waterhouse, Atkinson, Edwards, & Reilly, 2005). Such knowledge can be applied to the medical field.

Sleep Inertia

The final determinant of fatigue is known as sleep inertia. Sleep inertia concerns the time period immediately after one wakes. It is known that cognitive performance is altered in the immediately after waking. For some individuals, this alteration may last
only 10-15 minutes. However, for others, it may last a few hours. Such impairment is made worse by circadian disruptions and sleep deprivation (Mountain, et al., 2007).

A study published in 2009 defined sleep inertia as the period of time between being asleep and fully awake or residual sleepiness. Decision-making is often impaired during this time period, and the level of impairment and length of sleep inertia depend upon the sleep stage one is in when awakened. It has been shown that individuals awoken during slow-wave sleep are more heavily impaired than those in other cycles. This cycle is usually entered 15 or more minutes after falling asleep. This particular study examined errors and error-detection processes following a one-hour nap in young adults. Participants were well rested prior to the study period and avoided alcohol, caffeine, and strenuous exercise. Reaction times, error rates, and error recognition were measured using an arrow orientation task. This particular study showed mild to no effect of sleep inertia on reaction times and error rates, but participants were well rested prior to the study with no sleep deprivation. However, participants’ ability to recognize their own errors was significantly reduced when awakened during slow-wave sleep (Asaoka, et al., 2009).

**Fatigue and Worker Safety**

**Motor Vehicle Accidents**

It is generally known that fatigue is the cause of many truck/semi-trailer accidents. In fact, the United States Department of Transportation considers driver fatigue to be the primary cause of serious crashes. The way in which truck drivers are scheduled to work may influence fatigue and its associated safety effects, and a 2002 study attempted to examine this possibility. Site visits and interviews were conducted at
13 carrier companies randomly selected throughout the United States, and surveys were conducted with these carriers’ drivers, dispatchers, and managers at various levels. Truck driver environments, economic pressures, and carrier support of fatigue safety measures were all considered. For the purpose of this study, driving environments included regularity of driving schedules, consideration of natural circadian rhythms, and quality and place of rest. Economic pressures included receiver demands and personal or group financial rewards and penalties. Of those truck drivers surveyed, nearly 50 percent reported being required to work all shifts of the day on a regular basis. Thirty-five percent reported that it was challenging on a regular basis to find a comfortable and safe sleeping place. Twenty percent reported making one or fewer stops daily, and 47 percent reported starting each new workweek tired. After a statistical analysis, starting a workweek tired was considered to be the most important factor influencing fatigue and safety, which suggests that recovery time should be taken into consideration when scheduling drivers’ shifts (Crum & Morrow, 2002).

Just as fatigue can play a large role in truck driver safety, the same can be said for medical resident safety. A study conducted by the Harvard Work Hours, Health, and Safety Group attempted to examine the effect of resident work hours on personal safety and motor vehicle accidents. Between the months of April 2002 and May 2003, approximately 2,700 residents in their first year of post-graduate medical training were asked to complete monthly web surveys concerning work hours, extended shifts, actual motor vehicle accidents, near-miss accidents, and involuntary sleeping. Those individuals who reported actual motor vehicle accidents were asked to provide documentation of accidents such as a police report or photos for validation. Most
participating residents worked in a medical specialty as opposed to surgical or hospital specialties, and the average number of reported working hours amongst participants was 70 weekly hours in a hospital. Of these 70 hours, an average of 67 were spent awake. More work hours were reported for outside studying and preparation. An average of four extended shifts (shifts 24 or more hours in length) was reported on a monthly basis with the average length being 32 hours in duration. During the reporting time, just over 300 actual motor vehicle accidents were reported with approximately 130 of them occurring on the commute from work to home. Statistical analysis showed that the risk of an actual accident or near-miss was much greater after working an extended shift. Specifically, each extended shift scheduled per month increased the monthly rate of motor vehicle crashes by nine percent. This increased to 16 percent on commutes from work to home following an extended shift (Barger, et al., 2005, p. 129).

A recent study conducted at Yale-New Haven Hospital during June and July of 2013 examined brake reaction times in internal medicine and orthopaedic surgery residents following traditional call shifts and night float shifts. Night floats have been substituted for traditional call periods in many institutions in response to the 2011 ACGME duty hour regulations. Residents in their first through fourth years of training volunteered to participate. Twenty-four residents were working a night float schedule during the study, and 34 worked traditional call shifts. Traditional shifts were 28 hours in length from 6:00 AM to 10:00 AM the following day, and night float shifts were from 6:00 PM to 8:00 AM the next day. Residents were asked to register their motor brake reaction times on an electronic brake simulator at the beginning and end of each of their call shifts. They were also asked to complete the Epworth Sleepiness Schedule at the
beginning and end of each shift. Researchers hypothesized that residents working a night float schedule would have faster reaction times than those working a traditional call schedule. It was found that when all reaction times were averaged together for internal medicine and orthopaedic surgery residents, those residents working a traditional, 28-hour shift exhibited significantly worse brake reaction times at the end of shifts, while those residents working night float shifts did not exhibit any significant differences. Both groups showed significant differences in the sleepiness scale at the end of shifts. When the two specialties were compared, orthopaedic residents showed a significant difference in brake reaction times, while internal medicine residents did not (Talusan, et al., 2014). Such results show that fatigue may jeopardize resident safety and well-being.

**Burnout & Suicide**

It is known that suicide and suicidal thoughts are more common in physicians than other professions and the general public. Amongst physicians, specialists are more prone to the actual act of suicide and suicidal thoughts than their non-specialist colleagues. Physicians most often cite problems at work, time pressures, work environment, exhaustion, and communication as reasons for suicidal behavior. In academic institutions, these factors may be compounded by the expectation to merge a medical career with additional academic duties such as research and teaching. Depressive symptoms are likely to increase as physicians progress through residency, which may be due to the fact that residents are younger than attending physicians and are required to work when physically or mentally stressed or sick. Some residents may cope with exhaustion by distancing themselves from their jobs and patients or by turning to
demanding or threatening behavior during patient encounters (Eneroth, Senden, Lovseth, Schenck-Gustafsson, & Fridner, 2014).

In a 2005 study, nearly 1400 attending specialists and 500 residents at Swedish universities were questioned using a web-based survey. Individuals were questioned about work-related factors, health-related behavior, psychological distress, demographic factors, and suicidal ideation. Although researchers anticipated that exhaustion would be related to suicidal thoughts in attending physicians and residents due to its known connection with burnout, it was not shown to affect suicidal thoughts in this particular study (Eneroth, et al., 2014).

In contrast, another 2005 study conducted amongst Dutch medical residents showed a connection between burnout and suicidal thoughts. Burnout ratings are comprised of three factors: exhaustion, depersonalization, and personal achievement. Approximately 5,000 residents were asked to self-report information using the Dutch version of the Maslach Burnout Inventory (MBI). A 40 percent response rate was achieved. Of those residents who completed the self-reports, 20 percent reported burnout. Twelve percent reported having suicidal thoughts at least once during their residency training. Rates of suicidal thoughts were higher in the group of residents who reported burnout than in the non-burnout group. Just over 20 percent of burned out residents reported suicidal thoughts, while those not experiencing burnout exhibited only an 8 percent rate of suicidal thoughts. Only 3.9% of the general Dutch population reported having suicidal thoughts in the same year. Amongst Dutch residents, psychiatry residents were the most prone to suicidal ideation (Van der Heijden, Dillingh, Bakker, & Prins, 2008).
The MBI was developed to be administered to human services workers, such as teachers, social workers, medical professionals, mental health workers, attorneys, and police officers. It is now the most common method used to assess burnout levels in physicians and examines levels of exhaustion, depersonalization, and personal achievement since burnout is known to be related to increased errors, decreased safety of residents, and high levels of stress, depression, and burnout. A study was conducted using the MBI between the years of 2002 and 2005 at East Tennessee State University. A mixture of 227 family medicine and psychiatry residents responded to a web-based survey comprised of the MBI and the Work Environment Scale. Residents were asked to complete the survey twice (once at the beginning and once at the end) of each academic year for three years. A statistical analysis showed that many factors affect burnout levels in residents. Female residents exhibited lower levels of burnout than men, especially in the depersonalization category. Those residents with children exhibited lower levels of emotional exhaustion and depersonalization when compared to those residents without children. Female residents with children exhibited even lower rates of burnout. Residents from the United States reported higher levels of burnout than their peers raised in foreign countries. Finally, younger residents reported significantly higher levels of burnout than older residents (Woodside, et al., 2008).

A 2004 article published by *The Journal of the American Medical Association* summarizes studies that have been conducted on the topic of burnout in the physician population. Burnout is considered a work-related problem and occurs most often when workers spend most of their time and energy caring for others. In some studies, as many as 80 percent of physicians studied reported moderate to high levels of burnout. Up to 93
percent have reported depersonalization, and as many as 79 percent have reported feelings of low personal achievement. When surveyed, residents reported similar feelings. Burnout can lead to decreased job satisfaction, career changes, and depression. Higher levels of burnout are positively associated with higher levels of depression, and depression levels appear to be higher in residents than attending physicians. As burnout levels increase, residents have been found to report making more errors on a weekly or monthly basis (Chopra, Sotile, & Sotile, 2004).

A study conducted between the years of 2002 and 2005 focused on orthopedic residents. Specifically, it explored the effects of the ACGME’s 2003 duty hour regulation changes on burnout in this population. The ACGME’s 2003 duty hour changes were implemented on July 1, 2003. Twenty-one orthopedic residents at two universities were surveyed regarding various topics. Thirty-four residents working in the same two university programs were again surveyed in 2005, which was two years after the 2003 implementation. The MBI was used to rate emotional exhaustion, depersonalization, and personal achievement. Residents were also asked to share information regarding demographics, general health, work and life stresses, coping methods, marital status, and personal relationship issues. Burnout levels were high for residents in the 2002 survey. Those surveyed exhibited very high rates of exhaustion and depersonalization and moderate rates of declined personal achievement. Just over 30 percent of residents surveyed exhibited psychiatric morbidity. A positive correlation existed between burnout and anxiety, long work hours, work and home conflict, and stressed relations with other members of the healthcare team (e.g., nurses, attending physicians, fellow residents). Following the implementation of the 2003 duty hour rules,
residents reported working less hours. Prior to the new rules, residents reported working an average of just over 88 hours each week. After the new rules were implemented, residents reported only working just over 70 hours. Rates of emotional exhaustion were significantly lower in surveyed residents in 2005, and depersonalization rates were somewhat lower. Levels of personal achievement were higher, and fewer residents exhibited psychiatric morbidity. Therefore, it appears in this study that the ACGME’s 2003 changes positively affected all aspects of the MBI (Barrack, Miller, Sotile, Sotile, & Rubash, 2006).

Introductory information in a 2009 study claims that burnout has been associated with suboptimal patient care, medical errors, and reduced empathy. Although the MBI appears to be the standard tool used to assess burnout levels in individuals, it is long in length (22 questions) and can be difficult to administer to healthcare providers. Therefore, this study aimed to explore the association of two particular questions with burnout in an attempt to shorten the required time necessary for accurate assessment in healthcare providers. Researchers attempted to show that answering or rating only two questions on the MBI will likely provide the same result or burnout level as completing the entire survey. The first question states, “I feel burned out from my work.” The second question states, “I have become more callous toward people since I took this job.” When surveying medical students, internal medicine residents, internal medicine faculty, and practicing surgeons, it was found that similar levels of burnout were indicated when taking the entire survey as when only answering the two specific questions. Although researchers do not recommend completely replacing the MBI with this shorter test when assessing burnout in healthcare providers, it may provide a less-involved way to assess
burnout levels and protect safety amongst residents and patients (West, Dyrbye, Sloan, & Shanafelt, 2009).

A study conducted during the 2009-2010 academic year at the Philadelphia Veterans Affairs Medical Center and the Hospital of the University of Pennsylvania studied the effects of sleep on burnout, depression, and empathy. Approximately 100 internal medicine interns participated in the study while on internal medicine or oncology rotations. Just over 50 percent of the participants were women, and the mean age of the interns was approximately 28 years. Rotations were split into four-week blocks, and interns were randomly assigned to groups that were permitted to take overnight call under the ACGME’s 2003 duty hour regulations and groups that observed a protected sleep period from 12:30 AM-5:30 AM each day. Cell phones and pagers were taken from interns assigned to the groups observing protected sleep periods, and interns assigned to night-float coverage instead answered calls. Wrist monitors were worn to monitor sleep.

At the beginning and end of each rotation, interns were asked to complete a Beck Depression Inventory (BDI-II), Maslach Burnout Inventory (MBI-HSS), and an Interpersonal Reactivity Index (IRI) to assess levels of burnout, depression, and empathy. Researchers hypothesized that interns observing protected sleep periods would exhibit more hours of sleep and more favorable levels of burnout, depression, and empathy at the conclusion of rotations. A significant difference was found in the number of hours of sleep obtained between the two groups. Interns in groups assigned to observe sleep periods obtained a significantly higher number of sleep hours than those who were allowed to take call during the study period. However, no significant differences were
observed in burnout, depression, and empathy levels between the groups (Shea, et al., 2014).

A 2011 study conducted by researchers at Texas A&M University focused on burnout amongst physicians in integrated health systems. Integrated health systems are usually large, employ a significant number of physicians, and are aimed at increasing efficiently and reducing costs. It is known that burnout affects 30-70 percent of physicians today and can result in decreased patient satisfaction, decreased job engagement, and early exits from the medical field in some cases. This study used the Areas of Worklife Scale and the Maslach Burnout Inventory to study burnout. An online survey was administered to primary care physicians within the health system to collect initial data. Surveys were administered again 30 days later and again at 60 days. Researchers found that physicians cited their actual work environments (control, workload, rewards, community, fairness, and values) as the main causes of burnout. Compensation and rewards were not noted as a cause. Most noted was a loss of control in decision-making and practicing medicine. This suggests that physicians will need to be included in decision-making processes as healthcare systems and executives look for ways to be more efficient in the years to come in order to avoid increasing levels of burnout, early exits from the medical field, and decreased patient satisfaction (Gregory & Menser, 2015).

**Patient Satisfaction**

Burnout leads to a discussion of patient satisfaction. That is, physician or resident burnout can affect patient satisfaction, and a study published in 2012 and conducted in Greece provides one example of burnout leading to decreased satisfaction. While many
studies considering patient satisfaction and burnout are conducted in inpatient hospital settings, this study focused on primary care or outpatient office visits. Primary care is often considered the foundation of healthcare and is a place where patients may be counseled on blood pressure, glucose levels, smoking, diet, weight management, and sleep. In this particular study, 30 physicians and 300 of their randomly selected patients were surveyed. Burnout levels in physicians were again determined using the MBI, and patients were asked to complete satisfaction surveys regarding their primary care visit at the time of checkout. Most physicians in this study were men. Most were also married, had children, and had been working in the field for ten or more years. A statistical analysis found that physicians exhibiting high levels of burnout received significantly lower patient satisfaction scores than their fellow physicians who exhibited lower levels of burnout. Specifically, emotional exhaustion and depersonalization were negatively associated with patient satisfaction and were significant indicators of patient satisfaction, while personal accomplishment appeared to play little to no role in satisfaction (Anagnostopoulos, et al., 2012).

Physician job satisfaction and working conditions can also affect patient satisfaction, which was shown in a study conducted from 2009 to 2010. Both surgeons and patients were asked to complete questionnaires regarding working conditions and job satisfaction for physicians and care satisfaction for patients. The study was conducted in general surgery and visceral surgery departments in Germany, and 98 physicians and 122 patients participated. Questions for physicians focused on working hours, control, and co-worker relations, while questions for patients focused on time management, organization, provider knowledge, comfort, and staff kindness. Overall, 70 percent of
patients reported being satisfied with their surgical hospital stays. Physicians reported being moderately satisfied with their jobs and working conditions. A significant connection was found between physician satisfaction and patient satisfaction. That is, physicians who reported higher levels of satisfaction also received higher patient satisfaction scores (Mache, Vitzthum, Klapp, & Groneberg, 2012).

A study published in 2008 focused on patients’ perceptions of resident duty hours as they related to care and patient satisfaction under the ACGME’s 2003 duty hour regulations. Approximately 130 internal medicine patients were asked to complete surveys within 24 hours of discharge at three institutions in Wisconsin and Michigan between April 2004 and January 2005. The surveyed institutions were an academic medical center, a VA medical center, and a community teaching hospital. Patients were asked to answer questions concerning resident and nurse work hours and fatigue and discontinuity of care. They were also asked to answer questions concerning the quality of their care environment, trust in providers, and overall satisfaction. Survey results showed that patients believed residents involved in their care worked 60 hours each week, but patients also believed residents should only work 51 hours each week. Although researchers hypothesized that patients would be concerned about resident fatigue and discontinuity of care due to strong media coverage of the topic, the majority of surveyed patients claimed they were not worried about resident fatigue or discontinuity of care. They did not report interactions with residents who seemed too fatigued to provide care. Only 29 percent of respondents believed residents involved in their care worked too many hours, and 87 percent of respondents were not worried about hand-offs or discontinuity of care. However, 50 percent of the patients believed resident duty hours
should be restricted, and 53 percent felt safer if a member of their healthcare team was present in the hospital at all times. All these perceptions have the ability to alter patient satisfaction (Fletcher, et al., 2008).

Patient satisfaction can also play a role in patient safety. The American Academy of Otolaryngic Allergy (AAOA) provides one example of supporting information. Allergic rhinitis (hay fever) is common in the United States. In fact, 30-50 million people suffer from hay fever each year. Although associated symptoms of congestion, sneezing, and discharge are mild in many individuals, they may be debilitating to some and can cause excessive amounts of lost work time. They may also be associated with more serious conditions such as asthma, sinusitis, and other pulmonary diseases. When forming a work group to study the disease, treatment, and patient self-treatment, the AAOA found that almost 80 percent of hay fever sufferers never seek care partly because they do not feel healthcare providers consider their symptoms to be serious. Of those who seek care, only 20 percent recorded being somewhat satisfied or satisfied with their care and provider relations. Many did not fully understand their condition, and over 40 percent were confused by the medication regimen prescribed to them, which may have altered compliance (Marple, et al., 2007). This is just one example of the way in which patient satisfaction, which is often associated with physician fatigue and satisfaction, can affect patients’ willingness to seek care and safety.

**Patient Safety**

A 2006 article considered resident duty hours and how they can affect patient safety. Residents working in intensive care units, emergency rooms, and surgical specialties are more vulnerable to medical errors due to the complexity of cases, multiple
care episodes, and hundreds of data points. These workers are also often required to care for multiple patients at one time (Parshuram, 2006).

Healthcare workers are subject to fatigue due to acute and cumulative sleep deprivation, physical fatigue brought about by work-related tasks, circadian rhythm disruption, and personal issues. After 18 consecutive hours, performance levels drop to levels similar to those of drunken individuals. Fatigued physicians may, however, be more knowledgeable about individual patients than replacement physicians (Parshuram, 2006).

An ideal work schedule for physicians and residents has yet to be identified. Unlike other fields such as transportation and airlines, physician work hours are largely left unregulated with the exception of residents (Parshuram, 2006). Research regarding fatigue, work hour regulations, and patient safety brings about many different themes. It has been found that more strict duty hour regulations for medical residents lead to greater patient safety. More strict duty hour regulations have had little to no effect on patient safety. Stricter duty hour regulations actually lead to decreased patient safety.

**Theme 1-Increased Patient Safety**

The first theme to emerge from a review of existing research concerning resident duty hours is the theory that more strict duty hour regulations lead to greater patient safety. This theory is often cited when regulations are changed and is supported by a 2004 study published in *The New England Journal of Medicine*.

In this study, researchers at Harvard University’s Brigham & Women’s Hospital compared the number of serious medical errors caused by residents working a traditional schedule to residents working an intervention schedule with more opportunities for sleep.
Compared to a traditional, 80-plus hour workweek, residents placed on the intervention schedule worked only 63 hours each week and in shifts no longer than 24 hours. Residents were studying internal medicine and working in a Medical Intensive Care Unit (MICU) or Coronary Care Unit (CCU). Nurse reviewers and physicians collected data via chart reviews, voluntary reports, and direct observation. It was found that residents working the intervention schedule made 36 percent less serious medical errors than those working the traditional schedule (Landrigan, et al., 2004). A serious medical error is defined as “A medical error that causes harm or has substantial potential to cause harm, including preventable adverse events, nonintercepted serious errors, and intercepted serious errors, but not including errors with little or no potential for harm or unpreventable adverse events” (Landrigan, et al., 2004, p. 1841).

A 2002 article published in the *Journal of the American Medical Association* also validates this theory. The authors of this article considered 10 studies that had been conducted on surgical residents and concerned duty hours and patient safety. Each of these articles aimed to evaluate surgical resident performance before and after short-term sleep loss or post-call sleep loss. It was found that surgical residents averaged six or fewer hours of sleep each night. A lack of sleep was found to be responsible for as much as a seven percent difference in standardized test scores and increased anger and confusion amongst residents. Manual dexterity was negatively affected. Residents who were deprived of sleep were found to take as much as 30 percent more time to perform surgical procedures than when they received ample sleep hours, and they exhibited a 45 percent higher complication rate in surgical procedures compared to when they received
more sleep time (Veasey, Rosen, Barzansky, Rosen, & Owens, 2002), all of which support this first theme and calls to further restrict resident duty hours.

A 2006 study involving critical care nurses also supports the theme that restricted working hours increases patient safety. According to the study, 13 million patients are injured each year while hospitalized, and 100,000 of these injuries are due to preventable adverse events. Critical care patients are more susceptible to such injuries due to their higher levels of morbidity and inability to fight disease. Critical care nurses must be alert and able to notice small changes in their patients. For this reason, they were chosen as the population of interest in this study. A random sample of nurses was chosen from the American Association of Critical Care Nurses, and just over 500 nurses provided survey data in the form of log books concerning worked hours, vacation hours, overtime hours, and medical errors or near errors. Of those surveyed, two-thirds of nurses reported that they struggled to stay awake during the survey period, and over 200 errors were reported. Errors were not confined to night shifts, and the risk of making a medical error doubled when nurses worked more than 12.5 consecutive hours (Scott, Rogers, Hwang, & Zhang, 2006).

Another study involving nurses and fatigue further supports this theme. Completed in 2009, approximately 1,000 nurses sampled from nursing associations and organizations responded to an online survey concerning mental, physical, and total fatigue at the end of worked shifts. Fatigue of all types is known to play a role in decreased attention to detail, problem-solving initiative, motivation, and vigilance, and has led to calls for the federal government to limit work hours and overtime for nurses by the American Nurses Association. Fatigue can lead to increased numbers of medical
errors and injuries to healthcare workers. Seventy-four percent of nurse respondents actually completed the survey. Of those surveyed, two-thirds reported getting less than 7 hours of sleep each night. Over half of respondents worked more than 11 hours during each shift, and one-third reported working more than 40 hours each week. A Fatigue Survey Set (FSS) and Nursing Performance Instrument (NPI) were used to measure fatigue levels and types and perceived performance. In general, as fatigue levels and types increased, nurses reported decreased levels of perceived performance (Pasupathy & Barker, 2012).

Yet another study involving nurses supports the theme that long working hours lead to decreased patient safety. This study was conducted in Norway during the years of 2008 and 2009 and focused specifically on the length of time between shifts. Recovery time is known to affect employee health. The European Union’s Working Time Directive recommends 11 hours between leave and report times for shift workers to protect health. Members of the Norwegian Nurses Organization from hospitals throughout Norway were sampled for this study. A questionnaire was offered via hard copy or the Internet, and just over 2000 nurses responded, which was a 38.1% response rate. Only 1,990 of the respondents could be considered in the study. Several instruments were used to measure the effects breaks less than 11 hours in length on various indicators such as sleepiness, fatigue, shift work disorder, anxiety, and depression. The Bergen Insomnia Scale (BIS), Epworth Sleepiness Scale (ESS), Fatigue Questionnaire (FQ), Hospital Anxiety and Depression Scale (HADS), and Shift Work Disorder (SWD) instruments were all administered. A statistical analysis showed that breaks less than 11 hours were associated with higher levels of insomnia, excessive
sleepiness, fatigue, and shift work disorder in Norwegian nurses. However, shortened breaks between shifts did not appear to be associated with higher levels of anxiety or depression (Eldevik, Flo, Moen, Pallesen, & Bjorvatn, 2013).

A study conducted in 2007 produced mixed results concerning patient safety. Discharge data was obtained from the Nationwide Inpatient Sample from the Healthcare Cost and Utilization Project and analyzed. Over 7 million discharges were considered between the years of 2001 and 2004. Mortality rates of common diagnoses typically associated with high mortality rates were statistically analyzed in both medical and surgical patients. Comparisons were made between discharges occurring before 2003 when the ACGME first mandated an 80-hour workweek and after to see if changes in duty hours affected mortality rates in both groups. Mortality rates in medical patients decreased by almost 4 percent, but there was no significant difference found amongst surgical patients before and after the 2003 duty hour standards were implemented. Researchers believed several factors may have accounted for the differences between medical and surgical patients. First, the sample size was smaller for surgical patients than medical patients. Second, surgical residency programs may not have adhered to the new rules as closely as medical programs. Finally, any improvements in medical errors caused by surgical resident fatigue may have been cancelled by an increased number of hand-offs (Shetty & Bhattacharya, 2007).

Another study provided mixed results concerning patient safety. This observational study focused specifically on mortality rates with the Veteran’s Administration System before and after the ACGME’s 2003 duty hour regulations. Over 300,000 patients in just over 130 hospitals were considered ranging in treatment dates
from July 2000 to June 2005. Only those patients with diagnoses of acute myocardial infarction, congestive heart failure, gastrointestinal bleeding, or stroke were included, and patient files were examined for mortality. In this case, mortality was recorded only if patient death occurred within 30 days of hospital admission. Veteran’s Administration hospitals were considered teaching intensive or non-teaching intensive based upon resident-to-bed ratios. During 2004, one year after the ACGME’s 2003 duty hour regulation implementation, no differences were noticed in mortality rates compared to pre-regulation years for both medical and surgical patients. However, 2005 provided much different results in teaching intensive hospitals. The odds of mortality significantly decreased for medical patients. Again, no change was noticed in surgical patient mortality rates in teaching intensive hospitals (Volpp, et al., 2007).

**Theme 2-Little to No Effect on Patient Safety**

The second theme to emerge from a review of existing research concerning resident duty hours is that more strict duty hour regulations have little to no effect on patient safety. A 2012 article addressing the perceptions of general surgery residents supports this. Just under 6,000 general surgery residents participated in a survey following their 2010 American Board of Surgery In-Training Examination (ABSITE). They were asked to share their thoughts on how further restricting duty hours might improve patient care. They were also asked to provide thoughts about likely sources of medical errors. Although some residents believed requiring longer rest periods between work or call shifts may work to improve patient safety, only 20 percent of those surveyed believed a large or maximum benefit would be noticed. Less than 15 percent of those surveyed believed limiting shifts to 16 hours would increase patient safety to any large or
maximum amount. Instead of long duty hours and fatigue, a lack of ancillary support, incomplete hand-offs, a general lack of knowledge, and excessive workloads were blamed for medical errors (Borman, Jones, & Shea, 2012).

Morbidity and mortality rates were considered at Harbor-UCLA Medical Center in another study to determine if the ACGME’s 2003 duty hours affected patient safety. Harbor-UCLA Medical Center is a Level I trauma center, which means it is equipped to treat the most complicated trauma cases. Morbidity and mortality rates in trauma patients from July 1998-June 2003 were compared to rates from July 2003-June 2005 to account for differences in duty hour regulations. Almost 12,000 trauma patients were treated during the study period, and trauma morbidity and mortality rates were obtained from a public database. All patients considered were treated by residents who were supervised by attending physicians. While some morbidity measures significantly increased, others significantly decreased. Penetrating trauma rates increased as well as the reported septicemia cases and pulmonary embolisms. However, overall complication rates decreased. The mortality rates between the two studied time periods did not change (Virgilio, Yaghoubian, Lewis, Stabile, & Putnam, 2006), which leads one to believe that increased duty hour regulation did not affect overall patient safety.

Morbidity and mortality rates have also been studied in neurosurgery patients. Specifically, these rates were studied in patients who had either brain tumor or cerebrovascular operative procedures. Approximately 90,000 patients treated in both teaching and non-teaching hospitals were considered using data from the Nationwide Inpatient Sample Database and diagnosis codes. Approximately half of the patients were treated during the years of 2000-2002, which was prior to implementation of the
ACGME’s 2003 duty hour regulations. The other patients were treated during the years of 2005-2008, which was after the implementation of the ACGME’s 2003 duty hour regulations. Researchers hypothesized that an increase in complications, morbidity, and mortality would be noticed in teaching hospitals following the 2003 implementation due to increased hand-offs. When considering patients treated in teaching hospitals, patients treated in non-teaching hospitals, patients treated prior to the 2003 implementation, and patients treated after the 2003 implementation, the overall complication rate was almost 12 percent. There was no significant difference between complication rates before and after 2003 duty hour regulation implementation in teaching hospitals. A significant decrease was noticed in teaching hospital patients in respiratory complications and dysphagia, but a significant increase in nervous system complications, operative wound complications, and foreign bodies left behind was noted. Mortality rates significantly decreased in both teaching and non-teaching hospitals following 2003 duty hour implementation (Babu, et al., 2014).

Following the implementation of the ACGME’s 2003 duty hour regulations, surgical complication rates were studied as a patient safety factor during a seven-year period from July 2003 to March 2009. Laparoscopic cholecystectomies and appendectomies were chosen for the study because they are two of the most common procedures performed by surgery residents in the United States. Researchers reviewed medical records for over 1700 cholecystectomies and appendectomies performed at a public teaching hospital during the years studied. Rates of total complications, bile duct injuries, transfer to open (non-laparoscopic) surgery, length of surgery, and mortality were all recorded. The times of surgery were also organized and recorded into two
groups. The first time group consisted of surgeries performed between the hours of 6:00 AM and 10:00 PM (daytime). The second time group consisted of surgeries performed between the hours of 10:00 PM and 6:00 AM (nighttime). Surgeries performed during nighttime hours were performed by residents who had worked more than 16 hours continuously, while those surgeries performed during daytime hours were performed by residents who had worked less than 16 hours continuously. When compared, no significant difference was found between the two groups in total complications, bile duct injuries, transfer to open operations, length of surgeries, and mortality, which suggests that limiting duty hour shifts does not significantly affect patient safety (Yaghoubian, et al., 2010).

Another study was conducted within the Veterans Health Administration System (VA), which houses the most teaching programs in the United States. This study involved Medicare patients. Medicare patients receiving care outside the VA system were compared to those receiving care within the VA system. Residents with more restricted duty hours treated patients treated in the VA system. No relative difference was found between the rates of safety-related events in the two groups (Rosen, et al., 2009), which supports the theme that increasing duty hour rules has little to no effect on patient safety.

**Theme 3-Decreased Patient Safety**

A study concerning hip fractures shows that increased duty hour regulation can actually lead to decreased patient safety. The records of nearly 50,000 patients in both teaching and non-teaching hospitals were reviewed in this study. Each of these patients exhibited a primary diagnosis of a fracture of the neck of the femur (hip fracture). In reference to morbidity measurements following ACGME duty hour reforms and greater
restrictions, the study stated, “In all cases, there was an increase in incidence in teaching facilities. In all situations, teaching facilities after reform were associated with greater frequencies of complications, costs, or nonroutine discharges compared with teaching facilities before reform” (Browne, et al., 2009, p. 2083). Such complications may be increased hospital stays, nervous system complications, pneumonia, myocardial infarctions, serum reactions, hypertension, or septicemia, and they may likely be due to a decrease in the continuity of care patients receive as a result of decreased duty hours (Browne, et al., 2009).

Another study supports the theme that increased duty hour regulation and associated increases in hand-offs can lead to decreased patient safety. This study was conducted in 2007 and concerned emergency room hand-offs at an academic medical center with multiple emergency room shifts. Two trained medical students observed emergency room hand-offs for two months and used a standardized data collection form to take notes regarding location of hand-offs, duration, and topics discussed by physicians. All hand-offs observed were verbal conversations between physicians. Some hand-offs were between attending physicians, and others were between residents. Data collected on the standardized data collection forms stemming from verbal conversations was compared to written documentation found in patients’ electronic medical records to identify hand-off errors or omissions. Just over 100 hand-off sessions were observed during the data collection period and included approximately 1,000 patients. The average hand-off session involving attending physicians lasted just over 14 minutes and included approximately 10 patients. The average hand-off session involving residents lasted just over ten minutes and included almost 8 patients. Physical examination information was
presented differently by mouth when compared to patient charts over 13 percent of the time by attending physicians and 45 percent of the time by residents. Laboratory results were presented differently in verbal hand-offs almost 4 percent of the time by attending physicians and almost 30 percent of the time by residents (Maughan, et al., 2011). Such percentage rates lead one to believe that increasing the number of hand-offs experienced by patients leads to decreased patient safety.

**Existing Research Concerning 2011 ACGME Duty Hour Regulation Changes**

Although the AGME’s 2011 duty hour regulation changes were only implemented a few years ago, some research has emerged regarding these changes. One such study was conducted in January of 2012 at two large academic medical centers in Baltimore, Maryland. It was three weeks in length and was a descriptive, observational study. Trained undergraduate students observed ten internal medicine interns at one institution and 19 at the other institution during the course of the study. An iPod Touch was used by each observer to record findings such as time residents spent delivering direct patient care and indirect patient care, time spent carrying out educational activities, and time spent eating, sleeping, and participating in recreational activities. Direct patient care included speaking to patients and family members, performing procedures, and administering medications. Indirect patient care included viewing charts, writing orders and notes, transporting patients, and facilitating hand-offs. Rounding, attending conferences, and teaching were all classified as educational activities. During this three week period under 2011 regulations, it was found that interns in the studied institutions spent less time delivering patient care than interns did under the ACGME’s 2003 regulations. Only 12 percent of their time was spent delivering direct patient care. Sixty percent of their time
was spent delivering indirect care. Forty percent of their total time, no matter the activity, was spent in front of a computer screen. This may include such things as charting, completing orders, and the like. Interns spent a mean of just under eight minutes with each of their patients on their service per day (Block, et al., 2013).

A study conducted in 2012 focused on program directors’ perceptions of the ACGME’s 2011 duty hour regulations. Internal medicine program directors were chosen for this study because they represent the largest specialty. Over 300 program directors were contacted via e-mail and asked to participate in a survey in July of 2012. Nearly 240 program directors participated on a voluntary basis and returned the survey, which was a 73 percent participation rate. The survey consisted of 32 questions and touched on such things as overall perceptions, perceptions of each individual duty hour standard, and the like. The majority of participating program directors worked at academic medical centers. Just over half of surveyed program directors reported overall approval of the 2011 duty hour regulations. However, only 35 percent of directors expressed approval of the new regulation concerning shift lengths for PGY-1 residents. This was the largest area of disapproval. Just over 60 percent believed there should be fewer duty hour regulations. While over half of participants believed the new regulations improved residents’ quality of live, 60 percent believed resident education was compromised. In addition, 70 percent of program directors believed the 2011 regulations actually decreased residents’ preparedness for more responsibilities. Over half reported they did not believe the new regulations produced changes in patient safety, but they did report an increase in hand-offs and a decrease in both continuity of care and resident ownership of
patients. In addition, program directors also reported an increase in their own workloads (Garg, Drolet, Tammaro, & Fischer, 2014).

Another survey conducted in June of 2012 also focused on program directors’ perceptions of the ACGME’s 2011 duty hour regulations. This study was not limited just to internal medicine program directors. Instead, program directors in general surgery, internal medicine, and pediatrics were invited to participate. Program directors were chosen to complete the survey over residents because the researchers believed they were better suited to answer questions regarding patient safety and resident education. This was due to the fact that directors serve as practicing physicians and teachers. The survey consisted of 32 questions concerning approval levels of the new regulations and perceived effects on training, patient care, safety, and quality of life. Nearly 550 completed surveys were returned, which was an approximate 75 percent response. Most of the program directors oversaw pediatric programs and exhibited less than 5 years of experience as program directors. Although more specialties were included in this study, results were similar to the study only including internal medicine directors. Program directors showed overall approval for the 2011 regulations. However, most directors showed disapproval for restrictions placed on senior resident and PGY-1 shift length regulations. Again, most program directors perceived that patient care, supervision, patient safety, fatigue levels and test scores remained largely unchanged under the new regulations. However, general surgery directors were almost three times as likely to report a decline in patient safety than other directors. A majority of the respondents also again believed that education and preparedness were negatively affected following implementation. Most believed resident quality of life had improved, but they again also
reported an increase in their own workload and the necessity of utilizing more nurse practitioners and physician assistants to deliver patient care (Drolet, Khokhar, & Fischer, 2013).

Orthopaedic program directors and residents were the topic of study in a survey conducted between the months of April and July 2012. An online survey link was delivered to directors and residents via the American Orthopaedic Association approximately 1 year after the implementation of the ACGME’s 2011 duty hour regulations. Directors and residents were asked to provide their perceptions of the new regulations on patient safety, educational opportunities, fatigue, and supervision. Almost half of the program director population responded, and just over one quarter of residents responded. Nearly 20 percent of program directors and residents were satisfied with the 2011 rules. While over half of directors and residents believed the 2011 changes to night float were an improvement over 2003, only about 8 percent believed the 16-hour rule for first year residents as an improvement. Just 17 percent believed the 2011 changes actually improved patient care, and younger residents were found to have more favorable opinions of the 2011 changes than more advanced residents (Levine & Spang, 2014).

Patients’ perceptions of duty hours have also been studied since the 2011 regulations went into effect. Similar to the Fletcher study in 2008, patients’ opinions were gathered regarding fatigue and hand-offs via surveys. In this particular study, surgical inpatients at a Rhode Island academic medical center and associated community hospital were asked to complete surveys. Surveys were completed during the months of June, July, and August of 2013. The response rate was just over 70 percent with 513 surveys returned. The average length of hospital stay for surveyed patients was just over
four days. When asked questions regarding residents who were involved in their care, duty hours, and regulations, most surveyed patients believed residents should not be allowed to work more than 12 hours at one time. Most patients also thought they should be notified if the resident delivering their care had already worked more than 12 hours. The majority of patients believed less experienced residents, those in the beginning years of their training, should work less than 12 hours during each shift, and they did not believe shortening shift lengths would compromise resident education. The majority of these inpatients believed more medical errors occurred due to fatigue than hand-offs. When given the option of continuing care with a fatigued resident or being transferred to an unfamiliar resident in the hand-off process, the majority of individuals chose to transfer their care (Drolet, et al., 2014).

Finally, residents’ perceptions alone have also been studied, but usually in survey form. From December 2011 through February 2012, all ACGME-accredited institutions were invited to have their residents participate in a survey questioning residents’ perceptions of the ACGME’s 2011 duty hour regulations and their effects on resident well-being, resident education, and patient safety. Permission was obtained from the institutions’ Designated Institutional Officials (DIO) before surveys were distributed. Once a DIO agreed to participate, each official distributed surveys to residents. Just over 120 accredited institutions participated and were located in 41 states. Approximately 6,200 individual resident responses were obtained, which was about a 23% response. Most of the participating residents were training in internal medicine, family medicine, or pediatrics and were completing their first three years of residency training. Just over 20 percent of participants were training in surgical specialties. The survey consisted of 12
questions. While residents reported no change to most categories under the new 2011 rules, some notable information was obtained. That is, residents reported receiving more supervision than they did prior to the 2011 implementation. Almost 43 percent of residents saw no change in resident education, but almost 41 percent actually felt their educational opportunities worsened. Over half of the surveyed residents felt they were less prepared to take on more responsibility or to practice independently under the new rules. Over 70 percent of respondents reported an increase in transitions of care or hand-offs. While younger residents reported having an improved quality of life under the 2011 regulations, senior residents actually reported a decrease in quality of life. Work hours and sleep hours were largely unchanged after implementation, but work schedules appeared to worsen. Nearly half of the residents approved of the ACGME’s 2011 changes, but nearly 23 percent disapproved (Drolet, Christopher, & Fischer, 2012).

These results appear somewhat different than results from a survey conducted by Drolet and colleagues a year earlier. Prior to the implementation of the ACGME’s 2011 duty hour regulations, a survey was also used to derive residents’ perceptions of the likely effects of anticipated regulations. In a similar manner to the 2012 study, institution leaders were asked to distribute surveys to residents. Seventy-five institutions in 38 states were contacted to participate, and 23 institutions in 15 states actually agreed to participate. Surveys consisted of 20 questions and concerned awareness of the anticipated changes and perceptions of their effects. Just over 2,500 residents responded with completed surveys, which was a 22 percent response. Most respondents were again in their first three years of residency training. Prior to the implementation of the 2011 regulations, most residents stated they were familiar with the proposed changes. Most
residents believed quality of patient care would be compromised, as would education, knowledge, and preparation. Residents appeared to be divided as to whether or not they thought work hours would decrease. They were also divided on the issue of patient safety. That is, about the same amount believed patient safety would be harmed as believed safety would not be affected. Less than half of the respondents believed their teaching institutions would comply with the new rules, and most residents believed the new regulations would eventually lead to the requirement of longer residencies due to compromised educational opportunities. However, most residents did believe overall quality of life would improve for them under the new regulations (Drolet, Spalluto, & Fischer, 2010). While many of the anticipated effects were the same as perceived effects found a year later, the actual effects on quality of life were much difference than anticipated.

**Summary**

More stringent changes to resident duty hours required by the ACGME are often made in the name of patient safety. While some studies support the theory that toughened rules lead to greater patient safety, others provide different results. That is, other research actually shows that stricter regulations have little to no affect on patient safety and can even lead to increased medical errors and decreased patient safety. Little research currently exists regarding the existing duty hour regulations put into effect by the ACGME in 2011. Specifically, little research exists concerning the perceptions of plastic surgery residents in training with regards to duty hour regulations and patient safety, which was the purpose of this study.
CHAPTER THREE: METHODOLOGY

Introduction

The ACGME’s current duty hour regulations enacted in 2011 were more stringent than previous regulations and carry the potential to affect patient safety. While patient safety indicators may provide some insight into the regulations’ effects on patient safety, those studying and practicing medicine may be able to provide better insight based upon personal experiences. Therefore, the purpose of this ethnographic study was to describe the perceptions of plastic surgery residents regarding the ACGME’s 2011 duty hour regulations as they relate to patient safety at a Midwest academic medical center.

Research Question

One research question guided this study. How do plastic surgery residents believe the ACGME’s 2011 duty hour regulations have affected patient safety?

Method

This study was an ethnographic, qualitative study. Plastic surgery residents enrolled in an ACGME-accredited residency program at a Midwest academic medical center were personally interviewed by the researcher. Interviews were approximately 30 minutes in length and were conducted within the academic medical center during normal daytime working hours. Permission to conduct interviews during normal daytime working hours was obtained via verbal consent from the associated department chair prior to beginning interviews.

Description/Rationale of Participants/Sample

Ten plastic surgery residents at a Midwest academic medical center were eligible to be interviewed. Plastic surgery residents are members of the surgical specialty as
opposed to medical or hospital specialties. Only plastic surgery residents with at least one year of training under the ACGME’s current regulations were interviewed. Participation in the study was voluntary, and no compensation or gift of any kind was presented to participants. All ten eligible residents agreed to participate in the study and were interviewed. Saturation was met by the seventh interview.

**Instrumentation**

Participants were asked to answer approximately 14 questions in an open-ended fashion. All interviews were recorded electronically with a hand-held recorder and transcribed verbatim into a Microsoft Word document using Rev, a secure transcription service. Once complete, transcriptions were analyzed by the researcher to identify themes.

**Researcher’s Role**

As a former residency coordinator, the researcher served purely as a questioning agent. The researcher asked questions and, when necessary, prompted residents to elaborate on their answers based upon prior experiences with and knowledge of resident duty hours and accreditation. The researcher attempted to remove bias by using bracketing techniques. The researcher did not ask leading questions or share personal thoughts or perceptions regarding the research topic. Resident identification was not known or considered when coding transcribed interview materials.

**Data Collection Procedures**

Each research participant was provided with background information for the study verbally during a normally scheduled education conference with the permission of the associated department chair. Residents were then asked to participate via a written
participation letter distributed at the education conference and a personal phone call. The researcher attempted to contact each participant via phone no more than three times to schedule an interview. Participants were allowed to ask any questions prior to joining the study and were provided with a Bill of Rights for Research Participants (Appendix A). No signed consent form was required for this study.

Each participant was scheduled for an interview with the researcher via phone. Each interview was conducted at a Midwestern academic medical center between the months of February and March 2015. A standard conference room within the academic medical center was reserved for all interviews. A conference table, chairs, and wall-mounted computer were present in the conference room. Only the participant and researcher were present during each interview session, and the interviews were recorded using a hand-held voice recorder. No photographic equipment was present, and the researcher and resident sat across the conference table from one another.

A set of 14 questions (Appendix B) was used to guide each interview. All recorded interviews were then transcribed using Rev transcription service. The hand-held recorder and transcribed documents were all stored in a locked filing cabinet only accessible to the researcher at all times when not in use for interviews.

Data Analysis Plan

The researcher analyzed each transcribed interview with ethnographic coding. Both open and axial coding were conducted before data were organized into themes using Creswell’s method.
Quality and Verification

Once all interviews were transcribed and securely returned to the researcher in a Microsoft Word document, the researcher provided a copy of individual transcripts to each participating resident via e-mail for a member check. Each participant was asked to review the transcript and correct any errors or omissions within seven calendar days. If no response was received within seven calendar days, it was assumed that participants considered transcripts to be accurate. Five of ten participants completed the member check.

Ethical Considerations

Proper approval for the study was gained from Creighton University’s IRB prior to any research being conducted. The Midwest university’s IRB deemed approval was not necessary based upon the specifics of the study. All participants in this study were 19 years of age or older, and each participant voluntarily participated. Each participant was also allowed to ask additional questions of concern prior to beginning interviews. The researcher knew some participants personally. This may have presented a bias in answers or fear of retaliation if personal information was shared. However, participants were assured that all information shared during interviews, including quotations, would not be identifiable or linked to any individual, and answers would not affect their academic standing in any way. The residency program director was not made aware of which residents chose to participate.

Participants were never asked to supply their name, post-graduate year of training, or training site. A random participant number was assigned to each participant to ensure confidentiality. The name of the academic institute was not published to ensure
anonymity. Recording devices and transcribed interview materials were stored in a locked cabinet during the course of the study and only accessible by the researcher. Digital recordings were permanently deleted from the recording device at the conclusion of the study.

**Summary**

This study was an ethnographic, qualitative study that concerned the perceptions of plastic surgery residents regarding patient safety under the ACGME’s 2011 duty hour regulations. Ten plastic surgery residents at a Midwest academic medical center were personally interviewed within the academic medical center between the months of February and March 2015. A set of 14 questions was used to guide each interview. The interviews were then securely transcribed verbatim and analyzed by the researcher to identify themes. Residents were asked to verify transcripts, and participant confidentiality was maintained at all times.
CHAPTER FOUR: FINDINGS

Introduction

The purpose of this ethnographic study was to describe the perceptions of plastic surgery residents regarding the ACGME’s 2011 duty hour regulations as they relate to patient safety at a Midwest academic medical center. One research question guided this study. That is, how do plastic surgery residents believe the ACGME’s 2011 duty hour regulations have affected patient safety? Ten plastic surgery residents enrolled in an ACGME-accredited residency program were interviewed and asked to share their perceptions of the ACGME’s 2011 duty hour regulations’ effect on patient safety. Interviews were recorded, transcribed, and analyzed thematically. Five major themes were identified.

Review of the Methodology

This study was an ethnographic, qualitative study. Ten plastic surgery residents completing training in an ACGME-accredited residency program at a Midwest academic medical center were eligible to participate in the study. Only residents with at least one year of experience under the ACGME’s 2011 duty hour regulations were eligible to participate, and all eligible residents chose to participate in the voluntary study. Participants received no form of compensation for their participation. A personal interview was scheduled with each resident, and a set of 14 questions (Appendix B) regarding duty hour regulations and patient safety was used to guide each interview. Each interview lasted approximately 30 minutes and was conducted during daytime, working hours with the permission of the residents’ department chair. Each interview
was recorded using a hand-held recording device and later transcribed using a secure transcription service.

**Data Analysis Procedures**

Audio files for each interview were electronically sent to Rev, a secure transcription service. Transcripts were electronically returned to the researcher within 48 hours. The researcher reviewed each transcript for accuracy and then sent transcripts to participants via their corporate e-mail address. Each participant was asked to review the transcript for accuracy as well and report any errors to the researcher within seven calendar days. If no response was received, it was assumed the transcript was accurate and complete. This was considered a member check.

Five of ten participants participated in the member check. Once the member check was complete, the researcher again read all transcripts. The researcher then read through all transcripts a third time, this time highlighting meaningful segments of information. This was known as open coding. Key phrases and information were then manually organized into approximately 10 categories such as general knowledge, fatigue, and communication. This was known as axial coding. From these categories, themes were then identified.

**Results**

Upon analysis of transcribed plastic surgery resident interviews, five themes emerged regarding the ACGME’s 2011 duty hour regulations and patient safety (Appendix C). They were *resident fatigue*, *resident inexperience*, *patient hand-offs*, *at-home call*, and *night float*. 
Theme 1-Resident Fatigue

The first theme to emerge was resident fatigue. Fatigue was defined as being both mentally and physically tired. Many of the plastic surgery residents interviewed said they experienced fatigue at the end of a week or the end of a work shift and appreciated the presence of the 80-hour per week maximum rule and mandatory breaks and time away regulations implemented by the ACGME in 2011. Participant 2 stated, “It’s definitely mentally exhausting, even at 80 hours, but also physically.” Some residents stated that they traded showers and personal hygiene for sleep. Others stated that they sacrificed personal health and relationships for sleep. One resident believed the 80-hour weekly mandate was entirely reasonable because residents still worked double the number of hours as the average American worker. Participant 6 echoed this thought and said, “I think 80 hours is a lot anyways. On top of that, sometimes we go over a little bit, but I think the general idea of 80 hours is good, and I’m glad we have that in the hospital.”

When asked to relate fatigue to patient safety, most residents agreed that fatigue could affect patient care and again appreciated the ACGME’s 80-hour weekly mandate and mandatory shift breaks and time off. Many felt like they were more apt to make a mistake or miss important information pertaining to patient care. With regard to fatigue and patient safety, Participant 3 stated, “You tend to miss details. You’re not quite as focused on all the details just because you’re overwhelmed. You’re tired. You’re grumpy. You’re hungry.” One resident felt the ability to pay attention to details was particularly important in a surgical specialty as opposed to a medical specialty and stated, “Let’s say you were called back to the hospital within three hours after working for 16 hours, I think you’re still going to be able to work and focus on what you’re doing, but
you'll be tired. You're more likely to make a mistake or just pay not as much attention if you were more relaxed. I think in surgery it's very important to really be focused in terms of being in the moment of what you're doing.” One resident believed the ACGME’s 80-hour mandate definitely improved patient safety and stated, “I’ve certainly been in a situation where the 80 hours has helped me from being too fatigued to care for a patient.”

**Theme 2-Resident Inexperience**

The second theme to emerge from interviews with plastic surgery residents was resident inexperience. Inexperience was defined as a lack of general medical knowledge. This is often exhibited during a resident’s first year of training, or the intern year. One of the changes between the ACGME’s 2003 duty hour mandates and its 2011 duty hour mandates concerned interns’ shift lengths. As of 2011, interns are allowed to work a maximum of 16-hour shifts. When asked about the 2011 rules, most plastic surgery residents interviewed believed this new rule had a positive effect on patient safety. In reference to this rule and patient safety, one plastic surgery resident stated, “I think that that is a good idea. I think that with the less experience that they aren’t used to the long work days, and it’s a period of accommodation to be able to deal with longer work hours.” Participant 6 had similar thoughts and said, “I agree with it. I think especially when we’re starting out, we’re not used to sleeping little.” When recounting their intern years, many residents described this time as an adjustment. Work hours, medical knowledge, personal lives, expectations, responsibilities, and sleep schedules all had to be adjusted during their first year of training. Participant 4 referred to these adjustments as “conditioning,” and went on to say, “There’s no doubt that now I can pull a 24-hour shift and it’s no big deal. When I was an intern, it would have been a huge deal.”
Other residents had different thoughts regarding the ACGME’s 16-hour shift length rule for interns and patient safety. One resident in particular felt the new rule reduced overall manpower. This resident stated, “I think it reduces manpower and therefore could potentially negatively impact patient safety and care.” Some residents felt older, more experienced residents were required to do more work and take on more responsibilities to cover for interns as a result of the ACGME’s new rule, which could also negatively affect patient safety. One resident exhibited mixed feelings regarding the 16-hour rule with regard to patient safety. This individual stated, “The doctors are less experienced and so they are less likely to make some mistakes with the patient because they don’t spend as much time at work and they’re more rested and they’re not as tired. From a different standpoint though, they don’t work as much, so they don’t get as much experience as under the old rules.”

**Theme 3-Patient Hand-Offs**

The third theme to arise was patient hand-offs. Hand-offs were defined as transfers of patient care from one provider to another, usually at the end of a shift or duty period. Residents reported that hand-offs differed between rotations or departments within their teaching institution. For example, there were sizeable differences between the hand-off processes in general surgery and plastic surgery. Transfers of care in general surgery usually occurred only verbally between residents in a conference room each day. Residents usually spent one to two minutes discussing each patient before transferring care to a fellow resident. In contrast, plastic surgery hand-offs occurred every day at 6:00 AM and 6:00 PM. Residents leaving the hospital would first meet in a conference room to discuss patients’ standings throughout the day, pertinent test results,
and necessary work or care verbally with residents who would be taking over patient care
during the next shift. Residents and attending physicians often then went together to visit
patients on the hospital’s inpatient units to further discuss patients’ needs and progress,
view surgical incisions, and discuss information found in patients’ electronic charts.
Electronic checklists were also used to ensure proper hand-offs. This whole process took
approximately one hour depending upon the number of plastic surgery patients
hospitalized at any given time.

Most residents reported that they were rarely asked to leave the hospital in
violation of ACGME duty hour regulations in the middle of delivering patient care.
However, all residents interviewed expressed that the ACMGE’s 2011 duty hour
regulations were responsible for an increase in the number of patient hand-offs in their
teaching institution. One resident strongly believed that hand-offs greatly affected patient
safety in a negative manner. This resident stated, “I think the risks of that hurdle of hand-
offs are greater than the risks that occur with fatigued residents. I feel the greatest risk to
patient safety right now is due to frequent hand-offs. No matter the system that you set
up, things still get missed, I feel like.” Another resident stressed the importance of proper
hand-offs to patient safety and stated, “I think that the hand-off is really important. I
think that you can’t cut time there.”

Most of the other plastic surgery residents felt an increased number of hand-offs
did not negatively affect patient care, especially if they were performed properly. One
resident thought hand-offs usually went very smoothly and stated, “Most the times they
go fairly smoothly, especially on plastic surgery where we really do devote quite a bit of
time to the hand-off. We go to see every patient.” When asked if increased hand-offs
negatively affected patient safety, another resident stated, “If they’re done properly, no. Actually, the hand-off becomes an educational tool. It’s an opportunity for the senior resident to teach the junior residents things to look out for, talk about exams, talk about diagnoses.” Yet another resident seemed to have complete confidence in hand-offs with regards to patient safety, even if important information was left out during hand-off communication between residents. With regard to patient information being left out or lost during the hand-off process, this individual stated, “If it’s something they haven’t been told about, there’s always the option to look in the computer and look at what’s happened and what’s been documented. Somebody with a little bit of common sense can figure it out.”

**Theme 4-At-Home Call**

The fourth theme to arise from resident interviews was at-home call. At-home call was defined as a time period when residents are expected to be available to provide patient care and usually included hours after normal business hours through the next morning to business opening. In this case, residents were allowed to take call from home and return to the teaching institution if necessary. This was in contrast to in-house call where residents were required to remain at the teaching facility during the call period. At home-call is not subject to the same frequency restrictions as in-house call is under the ACGME’s 2011 duty hour regulations, but residents are required to log duty hours worked if they are required to return to the hospital during a call period.

Residents reported that plastic surgery residents take more in-home call than other surgical specialties. Plastic surgery residents felt this was due to the fact that plastic surgery patients generally did not have as many critical illnesses as other specialties like
general surgery. Most questions and concerns could be handled over the phone during the middle of the night and further addressed during normal business hours the next day by plastic surgery residents. While plastic surgery residents were not always required to return to the hospital when paged during the middle of the night, the frequency of calls was sometimes high. Residents reported receiving on average three to four calls or pages during at-home call periods. However, they sometimes received a call every hour, which resulted in interrupted sleep. One resident stated, “It’s like they know as soon as I’m asleep. They start calling.” Another resident was not concerned about the number of calls received during an at-home call period and interrupted sleep and said, “It doesn’t really affect me. I have no problems going back to sleep. If I’m up all night I’ll be tired the next day, but if I have interruptions in my night it doesn’t bother me.”

In contrast, many other residents felt interrupted sleep caused by busy at-home call shifts led to fatigue and possible patient safety issues. One participant stated, “I would say the most frequent that I’ve had was about every hour,” in reference to the frequency of calls received. Even though residents were not always required to return to the hospital to perform consults or surgical procedures during the middle of the night while being on call, they still reported being tired the next day. When asked about the next day’s work, one plastic surgery resident stated, “If it’s a case you’re excited to do, you can certainly muster the adrenalin to. It almost seems like it’s no big deal, like you didn’t take call last night. If it’s something mundane and ordinary, say something you’ve done repetitively or it’s something you’re not interested in, then I think that you start to feel the fatigue more.” One resident suggested that some hours worked from home during an at-home call period should be counted towards the ACGME’s 80-hour weekly
limit even if residents were not required to return to the hospital. This resident felt it was hard to ask more senior residents or faculty members to return home to rest following an at-home call period when a resident was not required to return to the hospital but received several calls or pages. The resident stated, “I think sometimes it’s hard to request that if there’s no clear guideline that that is actually something that should be done.”

**Theme 5-Night Float**

The final theme to emerge was night float. Night float was defined as a time period when residents were expected to work a non-traditional, night schedule and handle hospital admissions. Night float shifts were previously unregulated by the ACGME but were limited to six consecutive nights for all residents in 2011 due to their stressful and taxing nature. All residents interviewed had completed at least one night float rotation, some prior to the ACGME’s 2011 duty hour regulation implementation and some after this implementation. These rotations were usually one month in length.

Residents reported completing night float rotations while on general surgery rotations in their teaching institution. Shifts began at 6:00 PM and ended roughly at 6:00 AM the next morning. Sometimes as many as 80 patients were cared for overnight by residents on a night float rotation. When asked about the environment of night float rotations, most residents believed it was a more stressful environment than other daytime rotations. One resident stated, “Yeah, I would say a night float, it can be a lot more stressful than your day work.” Some residents reported that it was an adjustment for their bodies to switch to night work, and one said, “Well, it’s rough. It’s tough to shift your thought process to sleeping through the day and working at night. I think that’s hard to do.” For some residents, it took a couple days to adjust, while it took a few weeks for
others to adjust to nighttime work. Some complained of a lack of a social life during these rotations and a lack of healthy eating options due to cafeteria and restaurant closing times.

Although residents considered night float rotations to be more stressful, they assessed value to them with one plastic surgery resident stating, “Night float is where you learn.” In terms of patient safety, residents did not feel night float rotations were dangerous to patients. A resident said, “For the most part, I think it was positive in terms of patient safety.” Most residents agreed that the ACGME’s 2011 mandates of only six consecutive nights of night float for residents worked to increase patient safety. When asked about patient safety, one participant stated, “It’s good for everybody to get out of here at some point. I think it goes along with the rule of one day off per week over four weeks. I think everybody needs a day away from the hospital. I think it’s good for the residents’ own mental health as well as patients’ safety from the regards of the residents’ mental health.”

Summary

This study was an ethnographic, qualitative study involving personal interviews with ten plastic surgery residents at a Midwest academic medical center. Interviews were transcribed using a secure transcription service and reviewed for accuracy by the researcher and by interviewed residents via a member check. Once reviewed, axial and open coding was used to separate data and organize it into themes. Five themes were identified, which were resident fatigue, resident inexperience, hand-offs, at-home call, and night float.
For the most part, residents felt the ACGME’s 2011 duty hour regulations contributed to greater patient safety. Most appreciated the ACGME’s 80-hour weekly maximum in combatting fatigue and mental errors. Most believed residents completing their first year of training or intern year were indeed less experienced, lacked overall general medical knowledge, and were more likely to commit errors. Overall, they felt limiting shift lengths to 16 hours for young residents were an asset to patient safety. If hand-offs were completed properly and with care, most residents felt an increase in hand-offs caused by the ACGME’s 2011 regulations outweighed potential hazards caused by fatigued residents. The ACGME’s 2011 regulation addressed in-house call frequency, but they did not address at-home call. Residents believed they took more at-home call in the plastic surgery specialty than other surgical residents and often experienced interrupted sleep that was not accounted for in their duty hour logs and associated fatigue that could decrease patient safety. Night float was thought to be a more stressful rotation than other traditional rotations by plastic surgery residents, and most believed the new 2011 regulation of limiting night float to six consecutive nights led to great patient safety.
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

Introduction

The Accreditation Council for Graduate Medical Education last changed its duty hour regulations on July 1, 2011. These changes made several of the duty hour rules stricter. Such changes may have already affected and may continue to affect patient safety. While some research does exist concerning the ACGME’s 2011 changes and associated effects on patient safety, much of this research focuses on medical specialties like internal medicine or obstetrics and gynecology in contrast to surgical specialties like general surgery or plastic surgery. This may be because medical residency programs employ more residents in the United States than surgical programs. Much of this research also focuses on perceptions of attending physicians and program directors or patient chart data. Resident perceptions of duty hours and patient safety have been considered in some research studies, but these studies usually only involve written surveys. Even less research exists concerning plastic surgery patient safety under the ACGME’s 2011 duty hour regulations. Therefore, the purpose of this ethnographic study was to describe the perceptions of plastic surgery residents regarding the ACGME’s 2011 duty hour regulations as they relate to patient safety at a Midwest academic medical center. Five themes emerged from this study, which may be used to develop future research studies and make recommendations to the medical community for future duty hour regulations.

Summary of the Study

The purpose of this ethnographic study was to describe the perceptions of plastic surgery residents regarding the ACGME’s 2011 duty hour regulations as they relate to
patient safety at a Midwest academic medical center, and one research question guided the study. That is, how do plastic surgery residents believe the ACGME’s 2011 duty hour regulations have affected patient safety? Ten plastic surgery residents with at least one year of working experience under the ACGME’s 2011 duty hour regulations were personally interviewed in this study between the months of March and April 2015. A set of 14 questions was used to guide each interview. Interviews were approximately 30 minutes in length and conducted during normal work hours with the permission of the residents’ associated department chair. All interviews were transcribed using a secure transcription service and reviewed for accuracy by the researcher and five residents via a member check. Once reviewed for accuracy, axial and open coding was used to separate data and organize it into themes. Five themes emerged from this study regarding plastic surgery residents’ perceptions of the ACGME’s 2011 duty hour regulations’ effects on patient safety. They are resident fatigue, resident inexperience, patient hand-offs, at-home call, and night float.

Summary of the Findings

Most residents interviewed in this study believed the ACGME’s 2011 duty hour regulations have an overall positive effect on patient safety. This study produced similar results to another study conducted in 2012 involving residency program directors. In that study, program directors also showed overall approval for the ACGME’s 2011 duty hour regulation changes, and general surgery program directors reported a significant increase in patient safety (Drolet, Khokhar, & Fischer, 2013).

The first theme to emerge in this study was resident fatigue. Residents reported that fatigue was a problem during residency training, and most appreciated the 80-hour
maximum workweek mandate set forth in 2011. When fatigued, multiple residents described themselves as not being as sharp as they normally might be with adequate sleep. They also said they were more likely to miss important information or indicators of patient wellbeing. In at least one instance, the 80-hour rule prevented a resident from providing sub-optimal care to patients due to fatigue. Such thoughts are supported by a study published in 2004 and conducted at Harvard University’s Brigham & Women’s Hospital. In this study, residents working an intervention schedule with more opportunities for sleep made 36 percent less serious medical errors than those working a traditional schedule (Landrigan, et al., 2004).

The second theme to emerge in this study was resident inexperience. Most residents who were interviewed believed the ACGME’s 2011 rule limiting shift lengths to 16 consecutive hours for residents in their first or intern year of training added to patient safety. This is in contrast to a study conducted in 2012 involving orthopaedic program directors and residents. Only 8 percent of orthopaedic program directors and residents believed limiting shift lengths for interns improved patient safety (Levine & Spang, 2014). When reflecting on their first years of training, many plastic surgery residents described this time as an adjustment. The transition from medical school to a surgical residency was difficult. As a resident, one is charged with actually caring for a patient. Expectations are higher. Sleep schedules are different. Hours are longer. Decision-making is necessary. Residents believed they did not have the general knowledge base needed to identify medical needs and plan proper treatment in an efficient manner early in their training. Therefore, most residents believed that limiting shift lengths for first year residents was a good idea. It allows interns to gradually get
used to residency expectations and develop necessary medical knowledge, which protects patients.

The third theme to emerge in this study was patient hand-offs. Residents interviewed reported that the ACGME’s 2011 mandates did result in more patient hand-offs, or transfers of care from one physician to another. A study conducted in 2007 showed that physical examination information was presented differently by mouth when compared to patient charts over 13 percent of the time by attending physicians and 45 percent of the time by residents during the hand-off process (Maughan, et al., 2011).

Plastic surgery residents stressed the importance of proper hand-offs in ensuring patient safety. Participants described their own hand-off process as a multi-stage process that happens twice daily. Residents first meet in a conference room to discuss all patients on a service. Those who have been caring for patients throughout the day share pertinent information with those who will be providing care during the next shift period. Residents and attending physicians then travel to patients’ rooms to discuss care with patients, inspect surgical incisions and wounds, and review important information in patients’ charts. This may include such things as test results, medications, and existing orders for care. Most residents felt comfortable with the process and also felt it promoted patient safety. They felt more comfortable with this multi-step process than with other rotations’ verbal hand-off processes. Many residents seemed to believe the quality of a hand-off determined patient safety rather than the number of hand-offs experienced by a patient. Therefore, the ACGME’s 2011 changes did not negatively affect patient safety.

The fourth theme to emerge from this study was at-home call. In-house call was further restricted by the ACGME in 2011, but at-home call was not subject to the same
duty hour restriction. Many of the plastic surgery residents who participated in the study believed that plastic surgery residents take more at-home call than residents in other surgical specialties. This is likely due to the fact that plastic surgery patients are not often as critical or unstable as patients receiving care from other specialties. For example, general surgery residents may be charged with providing care to patients who have suffered a severe trauma. Neurosurgery residents may be caring for patients who are recovering from dangerous brain surgery. Plastic Surgery residents are usually able to handle most plastic surgery complications over the phone during nighttime hours and actually address the situations in more detail the following business day. They are still required to be available to provide patient care at all times when on call, but they are often allowed to take this call from home. Other surgical residents are usually required to remain within the teaching institution when taking call. When plastic surgery residents are called during the middle of the night at home, time spent addressing pages and calls interrupts sleep and is not counted toward the ACGME’s 80-hour weekly work limit. Time is only counted towards this limit if residents are required to return to the hospital. Many plastic surgery residents expressed that they often felt fatigued after an at-home call shift even if they were not required to return to the hospital and felt this may lead to decreased patient safety.

The fifth and final theme to emerge from this study was night float. Most plastic surgery residents interviewed believed the ACGME’s 2011 mandate limiting night float to six consecutive nights also promoted patient safety. Such results are again similar to the 2014 study published by Levine and Spang. Half of program directors and residents reported to Levine and Spang that they believed the 2011 night float regulations were an
improvement from the ACGME’s 2003 regulations (Levine & Spang, 2014). All plastic surgery residents included in this study had completed at least one night float rotation where they were required to flip their normal work schedules and work from 6:00 PM to 6:00 AM for one month in most cases. Night float is thought to be a more stressful rotation. While residents agreed that night float is often more stressful than other rotations and is taxing physically, mentally, and socially, most residents had positive feelings toward their night rotations. Most experienced a period of adjustment to their new work schedule, but many described night float rotations as learning experiences. While most thoughts toward night float were positive, residents appreciated the 2011 rule limiting night duty to six consecutive nights, as they felt it gave them time to rest and recharge, which promotes patient safety.

Implications for Action/Recommendations for Further Research

The last time the Accreditation Council for Graduate Medical Education made changes to its duty hours before 2011 was July of 2003. The ACGME began to examine the effectiveness and associated effects of the 2003 rules in 2008. This suggests that the ACGME will begin to look at the effectiveness and associated effects of the 2011 duty hour regulations in the near future. Information gained from this study involving plastic surgery residents’ perceptions of the ACGME’s 2011 duty hour regulations’ effects on patient safety can aid decision makers when building future duty hour regulation:

1. Decision makers should involve multiple residents in future decision-making processes regarding duty hour regulations. Residents actually complete training and provide care to patients under rules handed down by the ACGME
and may have different perceptions of mandates and patient safety than
attending physicians, program directors, or the general public.

2. Decision makers should involve residents from multiple specialties (medical,
hospital, and surgical) in future decision-making processes regarding duty
hour regulations. Different specialties have different needs, work differing
numbers of hours, care for different types of patients, and may have differing
perceptions of duty hour mandates and patient safety.

3. Decision makers should involve residents from smaller specialties like plastic
surgery in future decision-making processes regarding duty hour regulations.
Although such specialties may not represent the majority of residents in
training, they may provide keen insight regarding duty hour regulations and
associated effects on patient safety.

4. Decision makers should consider making duty hour regulations specialty-
specific. Just as plastic surgery residents believe largely unregulated at-home
call may decrease patient safety in their case, other specialties may have
similar issues. This may mean duty hour regulations need to move away from
being a one-size-fits-all approach.

While this study provides valuable information regarding the perceptions of
plastic surgery residents regarding the ACGME’s 2011 duty hour regulations and patient
safety, further research can be conducted on the topic to aid decision makers in future
years. The same study design may be extended to other surgical specialties and medical
and hospital specialties to gather additional resident perceptions concerning duty hours
and patient safety. Other members of the healthcare team like nurses, mid-level
providers, medical assistants, technicians, and administrative staff members may also be surveyed to determine their perceptions of resident duty hours and patient safety. Many of these team members work closely with residents on a daily basis and may be able to provide interesting insights regarding duty hours and patient safety. More residents from various specialties may also be surveyed to determine if any differences exist in perceptions of duty hours and patient safety based upon chosen specialty, age, gender, location of training, and marital status. All these possible studies would provide valuable information to the medical community regarding the effects of resident duty hour regulations on patient safety.

Summary

The ACGME implemented new duty hour regulations for all residents in ACGME-accredited training programs on July 1, 2011, which may affect patient safety. However, little research currently exists regarding resident perceptions of the 2011 regulations’ effects on patient safety. Specifically, little research exists concerning the perceptions of plastic surgery residents. Therefore, ten plastic surgery residents were interviewed in this ethnographic study concerning plastic surgery residents’ perceptions of the ACGME’s 2011 duty hour regulations’ effects on patient safety. A set of 14 questions was used to guide each interview, and each interview was recorded verbatim. Once transcribed by a secure transcription service, transcripts were reviewed for accuracy. Axial and open coding was used to separate data and organize it into themes. Five themes relating to patient safety arose from this study, which were resident fatigue, resident inexperience, patient hand-offs, at-home call, and night float. Overall, plastic surgery residents interviewed believed the ACGME’s 2011 duty hour regulations had a
positive impact on patient safety. This is in contrast to some existing research concerning the 2011 duty hour regulations and patient safety stemming from patient charts or perceptions of attending physicians, program directors, and the general public. This suggests that it will be important for the Accreditation Council for Graduate Medical Education to consider the thoughts of residents from multiple specialties when constructing further duty hour regulations. Residents may in fact provide vital information needed to improve patient safety.
References


Appendix A

Bill of Rights for Research Participants

As a participant in a research study, you have the right:

1. To have enough time to decide whether or not to be in the research study, and to make that decision without any pressure from the people who are conducting the research.

2. To refuse to be in the study at all, or to stop participating at any time after you begin the study.

3. To be told what the study is trying to find out, what will happen to you, and what you will be asked to do if you are in the study.

4. To be told about the reasonably foreseeable risks of being in the study.

5. To be told about the possible benefits of being in the study.

6. To be told whether there are any costs associated with being in the study and whether you will be compensated for participating in the study.

7. To be told who will have access to information collected about you and how your confidentiality will be protected.

8. To be told whom to contact with questions about the research, about research-related injury, and about your rights as a research subject.

9. If the study involves treatment or therapy:

   a. To be told about the other non-research treatment choices you have.

   b. To be told where treatment is available should you have a research-related injury, and who will pay for research-related treatment.


1. Tell me about the Accreditation Council for Graduate Medical Education’s (ACGME) current duty hour regulations.

2. When you first learned about the ACGME’s current duty hour regulations, what were your initial thoughts?

3. Tell me about any of the duty hour regulations you like.

4. Tell me about any of the duty hour regulations you dislike.

5. What has been the influence of these duty hours on you?

6. Describe a time when you may have been asked to leave the hospital to comply with duty hour regulations.

7. Describe a time when one of your team members may have been asked to leave the hospital to comply with duty hour regulations.

8. Take me to a time when you may have been asked to take over the care of a patient from another resident who was asked to leave the hospital to comply with duty hour regulations. What was that like?

9. Describe a time when you needed to hand-off care to another resident? What was that like?

10. Explain your perception of duty hours on patient care and safety.

11. What has been the influence of these duty hour regulations on patients?

12. If you know your response could never be traced, what would you tell me about duty hours’ effects on patient safety?

13. If you were King/Queen for a day, what would you tell the ACGME about duty hours and patient safety?
14. Do you have anything else you would like to tell me about duty hours and patient safety?
## Appendix C

### Themes

<table>
<thead>
<tr>
<th>Theme 1-Resident Fatigue</th>
<th>Supporting Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quote 1</strong></td>
<td>“It’s definitely mentally exhausting, even at 80 hours, but also physically.”</td>
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<tr>
<td><strong>Quote 2</strong></td>
<td>“I think 80 hours is a lot anyways. On top of that, sometimes we go over a little bit, but I think the general idea of 80 hours is good, and I’m glad we have that in the hospital.”</td>
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<tr>
<td><strong>Quote 3</strong></td>
<td>“You tend to miss details. You’re not quite as focused on all the details just because you’re overwhelmed. You’re tired. You’re grumpy. You’re hungry.”</td>
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<tr>
<td><strong>Quote 4</strong></td>
<td>“Let’s say you were called back to the hospital within three hours after working for 16 hours, I think you're still going to be able to work and focus on what you're doing, but you'll be tired. You're more likely to make a mistake or just pay not as much attention if you were more relaxed. I think in surgery it's very important to really be focused in terms of being in the moment of what you're doing.”</td>
</tr>
<tr>
<td><strong>Quote 5</strong></td>
<td>“I’ve certainly been in a situation where the 80 hours has helped me from being too fatigued to care for a patient.”</td>
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<table>
<thead>
<tr>
<th>Theme 2-Resident Inexperience</th>
<th>Supporting Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quote 1</strong></td>
<td>“I think that that is a good idea. I think that with the less experience that they aren’t used to the long work days, and it’s a period of accommodation to be able to deal with longer work hours.”</td>
</tr>
<tr>
<td><strong>Quote 2</strong></td>
<td>“I agree with it. I think especially when we’re starting out, we’re not used to sleeping little.”</td>
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<tr>
<td><strong>Quote 3</strong></td>
<td>“There’s no doubt that now I can pull a 24-hour shift and it’s no big deal. When I was an intern, it would have been a huge deal.”</td>
</tr>
<tr>
<td><strong>Quote 4</strong></td>
<td>“I think it reduces manpower and therefore could potentially negatively...”</td>
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</table>
| Theme 3-Patient Hand-Offs | Impact patient safety and care.”

**Quote 5**-“The doctors are less experienced and so they are less likely to make some mistakes with the patient because they don’t spend as much time at work and they’re more rested and they’re not as tired. From a different standpoint though, they don’t work as much, so they don’t get as much experience as under the old rules.” |

| Theme 4-At-Home Call | **Quote 1**-“I think the risks of that hurdle of hand-offs are greater than the risks that occur with fatigued residents. I feel the greatest risk to patient safety right now is due to frequent hand-offs. No matter the system that you set up, things still get missed, I feel like.”

**Quote 2**-“I think that the hand-off is really important. I think that you can’t cut time there.”

**Quote 3**-“Most the times they go fairly smoothly, especially on plastic surgery where we really do devote quite a bit of time to the hand-off. We go to see every patient.”

**Quote 4**-“If they’re done properly, no. Actually, the hand-off becomes an educational tool. It’s an opportunity for the senior resident to teach the junior residents things to look out for, talk about exams, talk about diagnoses.”

**Quote 5**-“If it’s something they haven’t been told about, there’s always the option to look in the computer and look at what’s happened and what’s been documented. Somebody with a little bit of common sense can figure it out.”

|  | **Quote 1**-“It’s like they know as soon as I’m asleep. They start calling.”

**Quote 2**-“It doesn’t really affect me. I have no problems going back to sleep. If I’m up all night I’ll be tired the next day, but if I have interruptions in my night it doesn’t bother me.”

**Quote 3**-“I would say the most frequent that I’ve had was about every hour.”

**Quote 4**-“It almost seems like it’s no big
<table>
<thead>
<tr>
<th>Quote 1</th>
<th>“Yeah, I would say a night float, it can be a lot more stressful than your day work.”</th>
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<tr>
<td>Quote 2</td>
<td>“Well, it’s rough. It’s tough to shift your thought process to sleeping through the day and working at night. I think that’s hard to do.”</td>
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<tr>
<td>Quote 3</td>
<td>“Night float is where you learn.”</td>
</tr>
<tr>
<td>Quote 4</td>
<td>“For the most part, I think it was positive in terms of patient safety.”</td>
</tr>
<tr>
<td>Quote 5</td>
<td>“It’s good for everybody to get out of here at some point. I think it goes along with the rule of one day off per week over four weeks. I think everybody needs a day away from the hospital. I think it’s good for the residents’ own mental health as well as patients’ safety from the regards of the residents’ mental health.”</td>
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**PLASTIC SURGERY RESIDENTS’**

deal, like you didn’t take call last night. If it’s something mundane and ordinary, say something you’ve done repetitively or it’s something you’re not interested in, then I think that you start to feel the fatigue more.”

**Quote 5**—“I think sometimes it’s hard to request that if there’s no clear guideline that that is actually something that should be done.”

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**Theme 5-Night Float**