# A Description of Variables Relevant to Nursing Care in Ambulatory Surgery Centers

By

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# DEDICATION

This work is dedicated to the Lord, without whom, I can do nothing

and

To my husband, Jason, and three beautiful children.

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TABLE OF CONTENTS

**Page**

LIST OF TABLES

LIST OF FIGURES

Figure Page

# Chapter One

This dissertation examines variables relevant to nursing care in ambulatory surgery centers (ASCs). Studies are needed within the context of this setting as no studies have examined important variables such as nursing working environment, labor, work functions and regulatory oversight in ASCs. Descriptive research is a necessary foundation to develop and understand of how specific variables impact outcomes such as patient safety and satisfaction in this setting. This dissertation uses the Minnick and Roberts Outcome Production Framework (A. F. Minnick, Roberts, Young, Kleinpell, & Marcantonio, 1997) to describe the specific variables of employment terms, organizational facets, and labor quality and quantity as they relate to a sample of ASCs across ten states.

## 1.1 Statement of the Problem

The number of Ambulatory Surgery Centers (ASCs) has grown dramatically in recent years. Recent statistics indicate there are currently 5,480 Medicare-certified Ambulatory Surgery Centers (ASCs), nearly equivalent to the 5,564 hospitals registered in the United States (Ambulatory Surgery Center Association, 2017). This estimate may reflect an underestimation in ASC facilities because it does not take into account ASCs lacking federal certification or state-specific licensure. In 2014, the number of all annual surgical procedures done in ASCs began to exceed those performed in hospital settings and contributed to two-thirds of surgeries (VMG Health, 2017). In addition to the increasing number of operations performed in these facilities, ASCs have also begun a shift toward the performance of more complex surgical procedures.

The rate of operations such as hysterectomies, prostatectomies, angioplasties, total joint replacements, bariatric procedures, and spinal surgery has increased substantially in ASC settings (Blue Cross Blue Shield Association and Blue Health Intelligence, 2016; Centers for Medicare & Medicaid Services, 2017; O. Idowu, Boyadjian, Shi, & Lee, 2017; Jewett & Alesia, 2018a; The Medicare Payment Advisory Commission, 2017). There has also been an observable trend in higher patient acuity levels observed in the ASC setting (E.; Rosero & G. Joshi, 2018). Patients presenting for surgery at ASCs are noted to be older and presenting with an increased number of active comorbidities and complicated medical conditions (E.; Rosero & G. Joshi, 2018). These conditions include diabetes, renal failure, pulmonary hypertension, heart disease, obstructive sleep apnea, presence of an implantable cardiac device, prior receipt of organ transplant, and cardiac angioplasty with or without stent placement (E.; Rosero & G. Joshi, 2018).

Adverse events and patient deaths have been noted to occur following outpatient surgery. No universal reporting system exists in non-hospital settings, and ASC state regulations vary widely regarding reportable events. Of note, ASCs in 17 states are not mandated to report adverse events and deaths (Jewett & Alesia, 2018b). In addition, Medicare-certified ASCs are required to track and analyze adverse events but are only required to report data on a minimum of 50% of Medicare patients undergoing surgery (US Code 42 CFR). This rule not only allows for up to 50% of Medicare-patient data to go unreported, but also fails to address patient data on those individuals who are not Medicare payment eligible. Furthermore, Medicare has recently proposed to stop collecting seven ASC quality measures, including data on ASC-to-hospital patient transfers.

Many studies have investigated nursing factors which may affect patient outcomes in settings outside ASCs. A large number of the studies are aimed at examining labor quantity with respect to nurse staffing (L. Aiken et al., 2011; Brooks Carthon et al., 2019; Carthon, Kutney-Lee, Jarrin, Sloane, & Aiken, 2012; Chau et al., 2015; Glance et al., 2012; He, Staggs, Bergquist-Beringer, & Dunton, 2016; Lee et al., 2017; McHugh, Ma, & Practice, 2014; J. Needleman, P. Buerhaus, S. Mattke, M. Stewart, & K. Zelevinsky, 2002; Jack Needleman et al., 2011). Other studies have examined the effects of self-scheduling (Bailyn, Collins, & Song, 2007), shift length (Dall'Ora et al., 2019; Stimpfel & Aiken, 2013), patient assignment (Allen, 2015), and overtime workload (Cho et al., 2016; L. F. Liu, Lee, Chia, Chi, & Yin, 2012) on various outcomes in hospitals.

Few studies have investigated the impact of nursing work environment and staffing specifically on surgical patient outcomes within the context of the hospital setting (Friese, Lake, Aiken, Silber, & Sochalski, 2008; Johnston et al., 2015; Kutney-Lee & Aiken, 2008; Yasunaga, Hashimoto, Horiguchi, Miyata, & Matsuda, 2012). Not much is known regarding current working conditions in ASCs. There is a paucity of research regarding the influence that nursing working conditions, such as temporal factors, workload requirements, labor quantity, and remuneration have on patient outcomes in ASCs. The functions of licensed nursing personnel and the impact of anesthesia delivery structure within ASCs also remains to be examined. Additionally, the relationship between state regulation and these nursing variables in ASCs remains unknown.

## 1.2 Purpose of the Study

The overall objective of the proposed study was to bridge the gap of what is known regarding working conditions, licensed nursing personnel functions, nature and characteristics of state and institutional regulation in ASCs. The Minnick and Roberts Outcome Production Model (Figure B1) has been used in prior research to describe several variables that may affect patient outcomes (A. Minnick, 2001). These variables are capital inputs, organizational facets, and employment terms which influence labor inputs, employee attitudes, and employee behaviors, patient characteristics, and patient experience (A. Minnick, 2001). The Minnick and Roberts Outcome Production Model contains many variables, thus, making it challenging to examine all variables discussed in this model in one study.

This study resulted in a description of organizational facets, employment terms, and characteristics of labor, specifically, labor quantity within the context of the ambulatory surgical setting. Since little is known regarding this area of research, a descriptive research approach was used in this dissertation to describe the phenomenon as it exists in its current state. Findings gathered from this study serve as a foundation for future studies examining associations between these and other variables in the Minnick and Roberts Outcome Production Model (A. Minnick, 2001) within the context of the ambulatory surgery setting.

### 1.3 Research Questions or Hypotheses

There are many gaps related to this phenomenon of interest that may potentially be filled with further research into this area. Given the constraints of resources and time in the doctoral program, focus during the dissertation period addressed the first priorities to be filled. This dissertation study was guided by the Minnick and Roberts Outcome Production Model (A.

Minnick, 2001) to describe organizational facets, employment terms, and characteristics of labor in the ASC setting using the following aims:

**Specific Aim 1:** Describe nursing working conditions in ambulatory surgery centers in the United States.

**Specific Aim 2:** Describe the functions of licensed nursing personnel in ambulatory surgery centers.

**Specific Aim 3:** Determine the relationships of state regulations and ambulatory surgery center Nursing working conditions.

The overall initial hypothesis was that ASCs would depict a variation of working conditions, nursing functions, and policies at the level of regulation. During the course of the dissertation process, the PI conducted a literature review on ASCs regulation that demonstrated significant variations across state regulation. It was noted that regulation via institutional policies had not yet been studied. Based on the findings of this independent literature review, the PI hypothesized that state regulation would also be associated with institutional policy at a variable degree.

## 1.4 Significance of the Issue and Need for Study

### Significance to Society

**The number of non-hospital surgeries.** The number of Ambulatory Surgery Centers (ASCs) continues to grow exponentially. The quantity of procedures conducted in the outpatient setting has continued to increase as progressively more surgeries are being performed in ASCs rather than in the hospital setting. The volume of operations performed in freestanding ASCs has also increased dramatically. In 1981, freestanding centers once accounted for 4% of surgeries performed in the outpatient setting, but this number was noted to climb to 38% of surgeries in

2005 alone (Munnich & Parente, 2014). In 2014, the number of annual operations performed in ASCs began to surpass those done in the hospital setting, constituting 65.9% of all surgical procedures (VMG Health, 2017). Recent statistics indicate there are currently 5,534 Medicare-certified ASCs; nearly equivalent to the 5,564 hospitals registered in the United States (Ambulatory Surgery Center Association, 2017). This estimate does not account for ASCs which are not federally-certified which may or may not hold licensure at the state level.

One important reason for this surge of procedures conducted on an outpatient basis is the potential cost-savings to patients associated with performing surgery in this setting (Crawford, Li, Sprague, & Bhandari, 2015; Fabricant et al., 2016; Munnich & Parente, 2014). The reduction in cost has been attributed to the efficiency of service operations in ASCs, lower surgical facility and operating fees, the absence of inpatient hospital room charges for uncomplicated surgeries, and decreased related costs for procedures performed in this setting (Munnich & Parente, 2014; Richter & Diduch, 2017). Decreases in resource utilization have also been shown to affect overall savings. For example, reduced nursing staff costs, as well as, medication and intraoperative radiologic exam costs are cited as elements contributing to savings (Bertin, 2005). The improved efficiency of surgical case turn-over time and overall decreased total length of time in surgery observed at most ASCs may also contribute to greater patient savings (Fabricant et al., 2016; Munnich & Parente, 2014).

Another potential contributor to the increasing number of procedures performed in ASCs is the financial interest of ASC physicians. In 2012, a Medicare report showed that more than 90% of ASCs were at least owned in some part, by physicians or physician groups (O'Neill, Frencher, & Pellegrini, 2017). Studies utilizing Medicare inpatient claims show an increase in the frequency of surgeries for physician-owned specialty hospitals and ASCs that was

significantly higher for physician owners compared with physicians not having an ownership stake (Mitchell, 2010). Another study examining the impact of physician ASC Board of Directors membership on volume of procedures, revealed that doctors who were active Board members had volumes nearly 27% greater than their non-Board member physician counterparts (Yee, 2011).

**The complex nature of surgeries and patient acuity.** The complexity of operations performed in non-hospital settings, facilities once only reserved for minor procedures, has increased. The types of surgeries conducted in ASCs has evolved throughout the last four decades. Facilities accepting Medicare payments are restricted, generally, to the performance of certain kinds of reimbursable operations. When Medicare coverage was first introduced for ASCs in 1981, the federal health insurance covered approximately 200 types of surgeries through its payment system (Munnich & Parente, 2014). Today about 3,400 different surgical procedures are covered under Medicare's ASC payment system (The Medicare Payment Advisory Commission, 2016).

ASCs have shifted toward the performance of more complicated surgical procedures. One study used 43 billion commercially insured members to assess the utilization of outpatient surgical settings for a variety of procedures. The report showed that the percentage of hysterectomies done at outpatient centers, for example, rose from 36% to 64% between 2010 and 2014 (Blue Cross Blue Shield Association and Blue Health Intelligence, 2016). The study further exhibited that the rate of other complex surgeries also increased in outpatient facilities. The number of angioplasty procedures and spine surgeries both showed an upward trend shifting from 43% to 50% and 61% to 82%, respectively (Blue Cross Blue Shield Association and Blue Health Intelligence, 2016).

Idowu and colleagues (2016) sought to examine the utilization of specific outpatient settings for spine surgeries, namely, comparing HOPD and ASC settings. Lumbar microdiscectomies performed in HOPDs increased dramatically from 18.7% to 68.5%, and utilization of ASCs for similar surgeries was also marked by growth. The study showed that between 2003 and 2014, the frequency of one-level lumbar decompression increased at a range of 0.7-10.6% and one-level posterior cervical decompression laminotomy increased up to 23.4% in ASC settings (O. A. Idowu, Boyajian, Ramos, Shi, & Lee, 2017). Just one year following data collection for this study, Medicare approved ten additional spine surgery codes for the outpatient surgery list and consequently added 25 more codes after 2015 (Jewett, 2018; The Medicare Payment Advisory Commission, 2016).

Additionally, some ASCs participate in conducting other complex orthopedic operations such as total joint replacements. In 2018, Medicare officially removed total knee arthroplasty from the inpatient-only procedure list, permitting reimbursement for these procedures in the outpatient setting (Centers for Medicare and Medicaid Services, 2017). Other procedures removed from the most recent inpatient-only list include gastroenterological and bariatric procedures such as laparoscopic para-esophageal hernia repair with fundoplasty, laparoscopic removal of restrictive gastric devices, and replacement of adjustable gastric restrictive devices (Centers for Medicare and Medicaid Services, 2017). Radical laparoscopic prostatectomies were also removed from this list (Centers for Medicare and Medicaid Services, 2017). The implication of the changes is that these procedures are now covered by Medicare's Outpatient Prospective Payment System, allowing patients to undergo these procedures in the outpatient setting. This change is significant as research on the impact of outpatient setting types and facility

characteristics on patient safety is not well-known, existing studies have shown inconsistencies in overall findings (Berglas et al., 2018).

Several sources have mentioned a trend in higher patient acuity observed in the ACS setting. The National Ambulatory Medical Care Survey (NAMCS) confirmed this tendency through an examination released by the National Center for Health Statistics. This analysis considered data available in the NAMCS for patients receiving care in the ambulatory surgical setting in 2006 and 2010. The findings concluded that both the age and presence of comorbidities of ASC patients had significantly increased from 2006 to 2010. Specifically, the number of surgical patients with complicated conditions increased from 12.8% to 13.9% during this term (Eric Rosero & Girish Joshi, 2018). In this review, complex conditions were defined as diabetes mellitus, chronic renal failure, pulmonary hypertension, valvular heart disease, obstructive sleep apnea, the presence of an implantable cardiac device, and patients who had received a prior organ transplant or cardiac angioplasty with or without stent placement (Eric Rosero & Girish Joshi, 2018). Rosero and Joshi (2018) also considered age as a complicated condition if patients were aged 80 years of age or older. Statistically significant increases were seen in the frequency of patients having implantable cardiac devices, heart failure, arrhythmias, chronic renal failure, diabetes, and most markedly, sleep apnea (Eric Rosero & Girish Joshi, 2018).

**Adverse events and patient death.** Adverse events and patient deaths have been noted to occur following outpatient surgery. The accuracy of data regarding the occurrence of untoward outcomes remains limited and inconclusive. The literature available regarding adverse outpatient surgical outcomes focuses mainly on hospital transfer or admissions after surgery and the number of outpatient surgical deaths. No universal reporting system exists in non-hospital settings, and ASC state regulations vary widely regarding reportable events. Specifically,

mandatory reporting of adverse events and deaths is not required for ASCs in 17 states (Jewett & Alesia, 2018b). ASCs holding a certified status to receive Medicare payments for eligible patients must meet certain reporting standards. Although Medicare requires that ASCs internally track and analyze adverse events, individual CMS-certified ASCs are only required to report data on at least 50% of the Medicare patients serviced (US Code 42 CFR). This rule allows up to 50% of Medicare-patient data to go unreported and does not address patient data for those surgical patients who are not Medicare payment eligible. Medicare representatives have commented that this limited reporting rule was established to avoid the inconvenience to ASCs associated with the reporting process (Jewett & Alesia, 2018b). In July, Medicare proposed to stop collecting seven ASC quality measures, including information on ASC-to-hospital transfers, which may further negatively impact the level of data available on adverse events in this setting.

Data on adverse events and patient deaths is even more limited within the context of office-based surgical settings. Many states do not detail specific licensure or accreditation requirements for office-based surgical suites. Also, office-based settings do not require CMS-certification if they do not seek payment from the federal entity for surgical services. The primary example of this type of environment is an office-based setting which conducts cosmetic surgery. These facilities typically elect to provide only first-party cash payment services, rather than accepting payment via insurance or Medicaid. This point is vital as cosmetic surgery accounted for 17.1 million operations over the last year. Of these procedures 72% were conducted in the private office-based setting, 19% in ASCs and only 9% were performed in hospitals (American Society of Plastic Surgeons, 2017). As a result of lack of regulation and the proliferation of unlicensed cash-payment surgical clinics, states such as Florida, have found it challenging for to know the exact number of operating cash-pay surgical clinics (CBS

Associated Press, 2014). This deficit of information leaves little regulatory oversight in these environments and reporting of adverse events and death if performed, is primarily left to the discretion of the facility.

Some limited data on adverse events and deaths occurring in non-hospital settings exist. One study examining seven years of Florida office-based plastic surgery data exhibited that plastic surgeons were at fault for a significant amount of deaths and hospital transfers (Coldiron, Healy, & Bene, 2008). During this time, licensed Florida offices were required to report adverse events, hospital transfers, and deaths in response to media reporting on multiple local cosmetic surgery deaths. Coldiron and colleagues (2008) showed that a total of 534 untoward incidents were cited with 143 surgeries resulting in reportable events. These events included operations performed on the wrong surgical site, brain or spinal damage, complications not contained within the informed surgical consent, removal of foreign bodies left inside of the patient during surgery, hospital transfer, and death (Healy et al., 2008). The study found that 60.8% of reported incidents were associated with cosmetic surgery. Additionally, 38% of these plastic surgery offices who disclosed events were accredited by a third-party accreditation body when incidents had occurred (Coldiron et al., 2008).

The literature suggests that adverse event reporting is not always performed. There are also discrepancies between unreported events and those found to have occurred following state-level and third-party quality and safety investigations (Boxwala et al., 2004). Accurate measurement of adverse events in the outpatient setting is difficult and presents facility resource constraints such as the cost of time and human resources involved in conducting quality and safety reviews (Mull, Borzecki, Hickson, Itani, & Rosen, 2013). Measurement of adverse events within outpatient settings relies on methods such as voluntary reporting, retrospective chart

reviews, and patient disclosure which are significantly limited by the accuracy of information that has been documented or disclosed (Mull et al., 2013).

Surgery is the most significant cause of large-volume hemorrhage which can increase surgical mortality from less than 1% to 20% (Mannucci & Levi, 2007; Marietta, Facchini, Pedrazzi, Busani, & Torelli, 2006). Surgical blood loss has been noted to be as high as 600 ml during laparoscopic prostatectomy, one of the procedures most recently approved for Medicare reimbursement in the ambulatory setting (Poletajew & Antoniewicz, 2012). Blood loss also contributes to the 56.5% of deaths and 49.8% of hospital transfers from ASCs associated with elective cosmetic procedures (Starling, Thosani, & Coldiron, 2012). This data is significant as some disadvantages are noted for surgeries in outpatient settings such as the delayed treatment of acute bleeding (Mioton, Alghoul, & Kim, 2014).

Liposuction is one of the most frequently conducted cosmetic procedures in the nation (Zakine, Baruch, Dardour, & Flageul, 2015). Large-volume blood loss, visceral perforation with resultant hemorrhage, and anemia are some potential procedural risks (Choudry, Hyza, Lane, & Petty, 2008). A study examining postoperative outcomes in 26,259 patients noted that anemia occurred as often as during 18% of lipectomy procedures (Triana, Triana, Barbato, & Zambrano, 2009). Lipectomy is usually performed in the office-based setting where resources for diagnosing and treating anemia are not readily available (Gupta et al., 2017). Acute local bleeding can result in hemodynamic changes that may ultimately lead to hypovolemic shock and death if left untreated. There are documented instances of anemia with patients necessitating blood transfusions and hospitalization after lipectomy, and that blood loss can reach levels high enough to cause patient harm (Karmo, Milan, & Silbergleit, 2001; Karmo, Milan, Stein, & Heinsimer, 1998; Llanos et al., 2009; Rosique, Rosique, & Rabelo, 2016; Samdal, Amland, &

Bugge, 1994; Swanson, 2012, 2013; Tsai, Lai, & Chan, 1998) In general, the reported incidence of death after lipectomy occurs at a variable frequency of 2.6 and 20.6 per 100,000 surgeries (Chow et al., 2015).

A recent investigative report also showed that 7,000 patients were transferred to the hospital following all types of surgeries conducted at ASCs and only one-third of these facilities participated in voluntary adverse event reporting (Jewett & Alesia, 2018a). Data including court records, federal and state inspection records, patient and family complaint reports, and autopsy reports were collected in six states. The data revealed that 14 patient deaths had occurred in these states following spine surgery in the two years following Medicare's decision to remove these procedures off of the inpatient list (Jewett & Alesia, 2018a). In the data, outpatient surgical centers lacked the skills to manage patients with difficult airways and the resources or skills needed to save patients who had bled to death (Jewett & Alesia, 2018a).

**Significance to Healthcare**

**Medicare spending.** ASCs have a significant fiscal impact, contributing to more than $90 billion in national service payments (Ambulatory Surgery Center Association, 2015). In 2014, Medicare spending on ASC services was $3.1 billion (VMG Health, 2017). The total number of surgeries performed in ASCs has continued to grow, now resulting in over $4.1 billion in Medicare spending (VMG Health, 2017). Despite the growing amount of money spent for surgeries in this setting, procedures performed in ASCs still offer considerable savings to Medicare and third-party insurances. Lower surgical facility and operating fees and overall ASC efficiency translate into savings for services rendered (Munnich & Parente, 2014; Richter & Diduch, 2017). For example, Medicare patients spent 25% to 39% less time in ASCs than in

HOPDs for similar procedures, resulting in less billable time for services (The Medicare Payment Advisory Commission, 2017).

The Medicare payment program and its eligible patient participants have experienced an average of $2.3 billion in annual cost savings because the program pays less for procedures performed in ASCs compared to hospitals and HOPDs. One study cited that ASCs saved Medicare over $7.5 billion between 2008 and 2011 alone (Fulton & Kim, 2013). A similar review conducted by the Department of Health and Human Services revealed that ASC rates for surgical procedures are often lower than HOPD rates, resulting in a savings to Medicare of nearly $7 billion between 2007 and 2011 (Office of the Inspector General, 2014). Recent data has also cited that Medicare pays ASCs 53% of what HOPDs are reimbursed for similar procedures, further elucidating the value of ASC services (American Medical Association, 2018). Also, this year's CMS payment rule reflects the lower costs paid by Medicare for ASC care. The federal agency increased ASC payments by 1.2%, which was lower than the 1.35% pay increase offered for HOPDs for similar procedures (Centers for Medicare & Medicaid Services, 2017).

Recent literature on the effect of surgical settings on cost-reduction shows an average cost savings of 17.6% to 57.6% for orthopedic surgeries performed in ASCs compared to similar procedures done in hospitals (Crawford et al., 2015). Another study used the 2006 National Survey of Ambulatory Surgery to compare overall cost for procedures performed in freestanding ASCs and hospital outpatient departments (HOPDs) to those performed within hospitals. The findings showed that ASCs could save $363–$1,000 per procedure before factoring in standard physician and anesthesia provider costs incurred by patients across all settings (Munnich &

Parente, 2014). The financial benefits for conducting surgeries in ASCs not only impacts the healthcare consumer but also decreases Medicare spending.

**Emergency room visits and hospital admission.** Hospital utilization after outpatient surgery is a meaningful and widely-recognized patient-centered outcome (Centers for Medicare & Medicaid Services, 2016). The most recent national hospital visit rate estimates after outpatient surgery was 0.5-9.0%, and this rate was almost 10% for those aged 65 and older (Centers for Medicare & Medicaid Services, 2016). This analysis also found that 1.3-13.6% of outpatient surgeries performed at HOPDs resulted in an inpatient admission (Centers for Medicare & Medicaid Services, 2016).

Overall, available data on hospital transfers and admissions after outpatient surgery show varying results and depict wide ranges of frequencies. One study conducted on the number of hospital admissions for veterans following outpatient surgery explained this. The study used CMS data, Current Procedure Terminology (CPT), and outpatient codes as data sources. The researchers found that about 20% of veteran outpatient surgeries resulted in hospital admission which was highly associated with the complexity of the surgical procedure performed (Mull et al., 2018). Of these admissions, 66% occurred the day of surgery, and only 1% of admissions were detected in CMS-reported data (Mull et al., 2018). There was considerable variation in the way admission diagnosis was entered. Mull and colleagues (2018) noted that approximately 4% of diagnoses were coded as complications of surgery and 6% were coded as "other aftercare," indicating patients who had initially recovered from surgery but required continued care. Other admission diagnosis codes were those related to an underlying condition associated with the indication for surgery (Mull et al., 2018). The variation in admission diagnosis coding

approaches found in the literature makes it challenging to determine and track trends for precise events or symptoms leading to hospital admission.

Studies have also found variations in inpatient emergency and acute care utilization following ambulatory surgery at the time discharge and beyond. This variation is likely because many available studies on the quality of the delivery of care in outpatient settings have focused on hospital transfers the day of surgery. The limitation of using this approach is that not all complications occur immediately after surgery (Coley, Williams, DaPos, Chen, & Smith, 2002; Day, Kwon, Inadomi, Walter, & Somsouk, 2011; Fox, Vashi, Ross, & Gross, 2014; Melton, Klein, & Gan, 2011). Fox and colleagues (2014) found that among nearly 4 million adult patients undergoing surgery in ASCs, hospital transfer at the time of patient discharge was minimal in comparison to acute care utilization within seven days after surgery. The acute care rate was almost 30 times that of post-discharge hospital admissions and varied across ASCs (Fox et al., 2014).

Another study examining outpatient colonoscopies found that patients more frequently required acute hospital care after discharge than immediate transfer to a hospital (Fox et al., 2014). An additional retrospective analysis of ambulatory procedures noted there were approximately 95 unplanned 30-day medical care visits per 1000 surgeries performed (Maggard-Gibbons et al., 2015). Of these visits, nearly 6% were to the emergency room department, and about 3% were made to inpatient facilities with almost 67% of these visits following surgery at free-standing outpatient surgery centers (Maggard-Gibbons et al., 2015). These visits are significant because the average cost of emergency room transfer, and hospital stay ranges from $2,183 to $26,299 (Hansen, Abbott, Johnson, & Fox, 2014). Coley and colleagues (2002) examined costs associated with admissions, as well as readmissions and found that 1.5% of

admissions were related to reasons other than pain. The authors noted a $2.4 million accrual in emergency room and inpatient charges from over 300 ambulatory surgical patients in their facility alone (Coley et al., 2002). Expenses associated with admission for pain after outpatient surgery were cited to be between $1,869 and $4,553 per visit and costs related to non-pain related admissions ranged between $12,000 and $36,886 (Coley et al., 2002). Other research has noted higher rates of unplanned admission varying by surgical specialty and operative time for patients undergoing outpatient surgeries. One study using the National Surgical Quality Improvement Program dataset found that hospital admission rates for outpatient general, gynecologic, urologic, orthopedic, and otolaryngologic surgery were as high as 1.21% to 3.73% (Mioton et al., 2014).

**Preventable adverse events and hospital admissions.** Adverse events in healthcare are cited as a top cause of injury and death in the United States (Donaldson, Corrigan, & Kohn, 2000). Some adverse events are not preventable, but research exhibits the majority of adverse events are errors that are mostly preventable (Centers for Medicare & Medicaid Services, 2016). Hospital admissions following ambulatory surgery present unplanned cost and time burdens for patients and hospital staff. Centers for Medicare and Medicaid Services (CMS) has determined that nearly 40% of direct admissions following outpatient surgery were preventable (Centers for Medicare & Medicaid Services, 2016). The agency cited that 40-60% of these admissions were related to adverse surgery events, anesthesia, or other suspected medical problems. Specifically, urinary retention, pain, vomiting, syncope, bleeding, and certain surgery-related complications were found to be the most common reasons for hospital admission (Centers for Medicare & Medicaid Services, 2016).

Complications following surgical procedures contribute to undue healthcare burden associated with hospitalizations. Preventable adverse events in ambulatory surgery have been noted to be less common than other causes of untoward outcomes, but are associated with the highest level of harm to patients (Woods et al., 2007; Zegers et al., 2011). Nearly 40% of adverse events following surgery are related to surgical site infection, 23% are caused by bleeding, and 22% are connected to other injuries (Zegers et al., 2011). Human factors play a significant role in the occurrence of adverse events associated with surgery and contribute to about 65% of reported incidents (Zegers et al., 2011). The incidence of preventable events occurring in the outpatient setting, has been found to be higher with ambulatory surgery than non-surgical procedures, medication errors, or complications from therapeutic medical care (Woods et al., 2007).

Several state media investigations were initiated in response to preventable adverse events in the ambulatory surgical setting. For example, a recent investigation launched in the state of New Jersey found that over 1,200 adverse events, including death and other disabilities requiring continued medical care, were reported between 2008 and 2017 (Washburn, 2018). In 2015 alone, 12 deaths and 161 preventable adverse events were reported by 160 licensed ASCs (Washburn, 2018). These reports are paramount as they highlight failure to rescue (FTR), a concept not yet examined within the context of ambulatory surgery settings. FTR is defined as the inability to prevent a clinically significant decompensation occurring from a complication of a medical illness or as a cause of medical care (Agency for Healthcare Research and Quality, 2018c). FTR addresses the degree to which healthcare providers can respond to and prevent such incidents from occurring (Agency for Healthcare Research and Quality, 2018c).

The cost of preventable surgical events and subsequent hospital care are significant to patients and payers. A study examining the impact of preventable adverse events on health care

costs and patient outcomes showed the difference in 90-day healthcare spending between those who suffered a preventable adverse event and those who did not was $35,617 (Encinosa & Hellinger, 2005). Encinosa and colleagues (2005) exhibited that those individuals with a preventable adverse incident had statistically significant higher hospital bills, physician costs, and outpatient expenses related to the event. The researchers also found that those suffering a preventable event were 64% more likely to require long-term medical care and were nearly three times more likely to die within 90 days than individuals who had experienced no adverse event (Encinosa & Hellinger, 2005).

**Significance to Science and Nursing**

**Ambulatory surgery nursing.** Ensuring rapid recovery from anesthesia and discharging patients when it is safe to do so is one goal of ambulatory surgery (Awad & Chung, 2006; Maurice, 2015). Although patient discharge home is the end of nursing service delivery, it is not the end of nursing responsibility (Patient Safety Advisory, 2005). Nurses are often the first to pick up on perioperative complications after ASC surgery in the recovery room or via follow-up with postoperative phone calls made to the patient. It is essential for nursing staff to recognize signs of distress or changes in a patient's condition and act accordingly. The prompt identification of these subtle changes in patient disposition may potentially be more challenging for nurses working in a fast-paced outpatient setting. Postsurgical patients spend approximately 53.1 minutes in the recovery room at free-standing ambulatory centers which is much less time than the average 79 minutes patients spend in the recovery room of HOPDs (Maurice, 2015).

The shortened window of time patients spend in free-standing ambulatory surgery recovery rooms includes patient assessments and the provision of discharge instructions performed by the nursing staff (Patient Safety Advisory, 2005). This point is important because

recovery room nurses have the additional task of giving instructions to post-surgical patients and their caregivers to ensure a safe post-operative recover once patients are discharged (Patient Safety Advisory, 2005). A recovery room nurse in this environment must balance both time-efficiency with the patient discharge process and thorough nursing care which can sometimes potentially result in a moral dilemma (Maurice, 2015). Staffing and patient assignments may also influence the attention given to post-operative patients in this setting. Adequate nurse staffing and careful planning of nurse-to-patient assignments are necessary to ensure that each nurse has sufficient time to assess patients and provide discharge instructions.

Patients who seek acute healthcare after outpatient surgery represent a missed or undiagnosed complication of care (Fox et al., 2014). One state found that of those patients needing inpatient care following ambulatory surgery, 12% of activities at the time of discharge and during post-discharge follow-up contributed toward hospital admission (Patient Safety Advisory, 2005). When patients are discharged home, they rely on comprehensive discharge instructions not only for post-operative care, but also regarding signs of potential post-surgical complications that may occur and how to address them. These instructions should be clear on what circumstances would warrant surgeon notification, when patients should seek emergency room care, and when patients should call the ASC for immediate follow-up. This is important because one study found that bleeding was the main reason for patient admission from home to the emergency room. The study noted that although these patients did experience episodes of bleeding, not all required emergency care, suggesting that patients were not informed appropriately on the level of expected postoperative bleeding (Twersky, Fishman, & Homel, 1997).

Another aspect of quality care is that ASCs rewarded or penalized on performance metrics may change the provider's decision to send a patient home or initiate transfer to a hospital for a higher level of care. This performance system could result in nurses potentially sending patients home instead of moving them to a higher level of care when further evaluation is prudent (Fox et al., 2014). Post-operative discharge home when post-operative disposition is questionable could have deleterious ramifications concerning patient well-being. It is cited that HOPD surgeons and nursing providers may not be aware of patient post-surgical hospital visits if patients seek care in ER or other hospitals (Centers for Medicare and Medicaid Services, 2016). This is also important because unknown acute care sought by patients after discharge makes it challenging for perioperative providers to participate in continued care.

**Nursing-sensitive outcomes.** Adverse events have been identified as nursing-sensitive outcomes (NSOs) (Bolton, Donaldson, Rutledge, Bennett, & Brown, 2007; Lucero, Lake, & Aiken, 2010; Pappas, 2008). The concept of NSOs was first introduced by the American Nurses Association (ANA) in an initiative to study the effect of nursing structure and process variables on patient outcomes in the acute care setting (Given & Sherwood, 2005). NSOs are defined as a patient's condition, behavior, or caregiver state which is responsive to interventions carried out by nurses (Maas, Johnson, & Moorhead, 1996; Stanton & Stanton, 2004). They have also been described as outcomes that have been achieved through nursing interventions (Gobel, Beck, & O'leary, 2006). Some examples of NSOs presented in the literature are patient falls, urinary tract infections, pressure ulcers, pneumonia, and medication errors (Pappas, 2008). The occurrence of these events is significant because nurses must keep patients safe by protecting them from the presence and severity of adverse events (Mushta, Rush, & Andersen, 2018)

FTR has also been cited as a NSO (Mushta et al., 2018; Jack Needleman, Peter Buerhaus, Soeren Mattke, Maureen Stewart, & Katya Zelevinsky, 2002). Mushta and colleagues (2018) suggest that failure to acknowledge the need to initiate the rescue process, failure to escalate care, and inappropriate decision-making are nursing-sensitive indicators affecting the outcome of FTR. Also, structural processes such as nurse staffing to patient ratio have been cited in several studies to influence the incident of FTR (Driscoll et al., 2018; Jack Needleman et al., 2002). One study showed a 7% increase in the chance of patient death within 30 days of hospital admission for each patient beyond the fourth assigned to nurses (L. H. Aiken, Clarke, Sloane, Sochalski, & Silber, 2002)Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). Some studies have also cited nursing skill mix as an indicator of FTR (Burston, Chaboyer, & Gillespie, 2014; Friese & Aiken, 2008; Jack Needleman et al., 2002).

**Issues and Challenges**

There are some inherent challenges to studying outcomes in the non-hospital surgical locations. Much of the current literature on adverse events occurring in the outpatient setting examine number of deaths and hospital transfer after surgical procedures. It remains unclear how accurate this limited data is because there is no universal reporting system used for such occurrences. In terms of outcome studies, available research also uses varying time periods to establish postoperative death and hospital admission subsequent outpatient surgery. The vast majority of studies investigating hospital transfers following outpatient surgery only quantify incidents of transfer directly from ASCs to the hospital immediately following procedures. This defined time-frame does not take into account the number of patients reporting to emergency rooms and intensive care units after self-admission once home either on the day of or the day after outpatient surgery. The challenge of using this approach is that not all postoperative complications occur prior to patient discharge home from the ASC setting.

Interpreting adverse event data is also challenging because it often relies on methods such as self-reporting and chart reviews, requirements for which mandatory reporting vary across states. Quality and safety issues may not always be reported to the state making it difficult to determine accuracy and challenging to access this data that may not be publicly-available. Moreover, the majority of the literature focuses on complications and adverse events associated with specific surgical procedures of interest as an examination to determine the appropriateness of conducting such surgeries in an outpatient facility.

# Chapter Two

## 2.1 Theoretical Framework

### Frameworks Considered for this Study

**Systems Theory.** German Biologist Ludwig von Bertalanffy initially presented his idea of General System Theory in 1937 (Pouvreau & Drack, 2007). Over a decade later, his first article on general systems was published, and in 1950 the manuscript was translated into English and later adopted as doctrine for General Systems Theory (Drack, Apfalter, & Research, 2007). The scientist viewed a *system* as a complex of elements that interact with one another and posited that phenomena could not be reduced to merely examining individual units (Von Bertalanffy, 1968). Von Bertalanffy (1968) proposed there were two types of systems; closed and open systems. Closed systems are those which do not interact with the external environment, while open systems do. The theory further holds that open systems are in a perpetual quest to maintain equilibrium, which is defined as the system's ability to self-regulate to offset any changes that may have occurred from interaction with the outside environment (Von Bertalanffy, 1968). Although Systems Theory originated within the field of Biology, Talcott Parsons was the first to apply the theory to social units, thereby broadening the framework's use (Parsons, 2007). Due to the transdisciplinary nature of the Systems Theory, it has now been widely used in the fields of biology, psychology, sociology, communications, mathematics, engineering, medicine, nursing, and Management Science (Anderson, 2016).

Systems Theory has several fundamental additional underlying assumptions including the presence of sub-systems, inputs, outputs, and a transformational process (Kast & Rosenzweig, 1972; Robbins & Coulter, 2005). An *input* is something that is entered into a system to receive

an *output*, or result produced by the system (Von Bertalanffy, 1968). Examples of *inputs* include individuals, capital, skills, technical knowledge, and stakeholder influence and demands (Chikere, Nwoka, & Publications, 2015). Examples of *outputs* are services, goods produced, profits, and satisfaction (Chikere et al., 2015). *Transformation* is the process in which an input becomes an *output* or how an *output* produces a new *input* when a system is being re-energized (Koontz & Weihrich, 2008). Each system is also believed to function in a state of dynamic equilibrium with internal or external feedback mechanisms in causing either positive or negative effects within the system (Funderburg, Levy, & Management, 1997). An advantage of this theory is its consideration for the external environment and how that environment impacts the overall organization and its ability to handle complex systems. Systems Theory also considers feedback caused by re-energizing the system to maintain a balance in the complex system.

**Institutional Theory**. The Institutional Theory dates back to the early influence of German sociologist Max Weber. Weber's early writings offered explanations for the concepts of *authority*, *rationality*, and *bureaucracy* (Giddens, 1971). His works introduced the notion of social institutions in which charismatic, hereditary, and bureaucratic leaders were able to exercise control over people; an idea later likened to the field of organizational management (Giddens, 1971). The term *institution* also dates back to Weber's manuscripts which explained that institutions were primarily formed by members who were voluntarily involved in or felt compelled to become involved in an organization to feel legitimate (Weber & Parsons, 1913). New forms of an organization then arise once society views the organization as reaching *legitimacy*, which is determined by the social acceptability of its actions by the people and relevant stakeholders (Miles, 2012). *Institutions* have also been defined as organizations with established practices that are guided by long-lasting formalized, rational beliefs (Lammers &

Barbour, 2006). *Institutions* are thought to arise through the development of shared norms within a social system or are constructed in a social environment over time (Zucker, 1977). *Institutions* have further been described as *regulative*, *normative*, and *cognitive* constructions or behaviors that provide context for social conduct (Scott, 1995).

The premise of the Institutional Theory is to explain the manner in which structures, such as rules and norms become established as guidelines for social behaviors (Scott, 2004). The theory seeks to explain how *institutions* adapt to their organizational environment through *rational myths*, or commonly shared beliefs (Meyer & Rowan, 1977). Key assumptions of this theory are that organizations within the same field tend to act a certain way, typically becoming homogenous over time and that organizations gain meaning and stabilization through core missions and goals (Miles, 2012). The essence of the conceptual framework is that rules, social norms, and routines become guides for social behavior and organizational practice over time, in part, explaining why organizations in similar fields behave in similar ways (Scott, 2004).

The Institutional Theory's focus is on explaining the *isomorphic pressures* that are placed on organizations including *normative*, *coercive*, and *mimetic pressures* (DiMaggio & Powel, 1983). *Normative pressures* tend to be brought about by professions where people with similar educational backgrounds tend to deal with situations similarly. With this type of pressure, legitimization takes place when individual achievements occur, for example, licensure and credentialing. *Coercive pressures* are forces brought about by other organizations (DiMaggio & Powel, 1983) and examples include government and state laws. Finally, *mimetic pressures* are those pressures to imitate another successful organization when unsure what to do. Institutional Theory surmises that activities occur within an *institution* as a result of individuals, the organization itself, or influence at the inter-organizational level (Miles, 2012). The way the

*institution* conforms in the face of such pressures varies but includes acquiescence, compromise, avoidance, resistance, or manipulation (Oliver, 1991).

Several approaches to the Institutional Theory are found in the literature. The *normative* approach seeks to understand behaviors by examining what people and groups of people view as logical and appropriate, resulting in individuals or groups acting a certain way based solely on normative standards (Olsen & Peters, 1996). The *rational choice* approach posits that institutions are made up of rules, incentives, and disincentives, and individuals will act by preferences based on these arrangements (Hay & Wincott, 1998). *Historical institutionalism* assumes that there is an internal dependency brought about by policy and structural choices made at the formation of an *institution* (Hall & Taylor, 1996). Finally, *empirical institutionalism* focuses on the establishment of formal governmental-type structures (Peters, 2000).

**Structure-Process-Outcome (SPO) Quality of Care Model.** The SPO was developed by a health services researcher, Avedis Donabedian, to address the concept of quality of care. The beginnings of the Donabedian model dates back to over 50 years ago when the researcher began to define the quality of care and approaches to quality assessment (Donabedian, 1966). Donabedian (1988) also believed that the definition of quality depends mostly on how health itself is defined. He posited that quality of care was too complicated and abstract to be directly observed and thus could only be inferred by measuring the structure, process, and outcomes of care.

Healthcare *structures* are defined as tangible resources such as material and human assets and organizational features, such as the structure of the institution within a setting of care (Donabedian, 1988) *Structures* also encompass provider qualifications such as board certification and training. *Processes* are a set of procedures or a sequence of methods carried out to elicit a

particular outcome, for example, nursing or medical care offered to a patient (Donabedian, 1988). *Outcomes* are described as the result of care when *structures* interact with *processes* (Donabedian, 1988). Examples of possible health *outcomes* are changes in a patient's health status such as recovery and survival. An important underlying assumption of the Donabedian model is that a relationship does exist between the *structure* and *process* or the *process* and *outcomes* of the measure of quality one wishes to examine. Donabedian (1988) also argued that neither *process* or *outcomes* was a better measure than the other, but rather, each one of these aspects may be more apropos for specific purposes of study.

Donabedian later proposed the seven dimensions of quality in the healthcare of efficacy, effectiveness, efficiency, optimality, acceptability, legitimacy, and equity. Donabedian defined efficacy as the capability of care to improve health, effectiveness as the degree to which health changes are noted, and efficiency as gaining the most considerable improvements in health at the lowest cost (Donabedian, 1990). Optimality was described as balancing costs versus benefits; acceptability as conforming to patient preferences; legitimacy as conformity to social preferences; and equity as the level of impartiality in the distribution of healthcare (Donabedian, 1990). Aspects of Donabedian's pillars of quality have since been accepted by various health organizations including the National Quality Forum, National Committee for Quality Assurance Process, Institute of Medicine (IOM), and the World Health Organization (WHO) (Ayanian & Markel, 2016; Wolfe, 2001; World Health Organization, 2006).

The SPO model is frequently utilized for examining the quality of health care in a variety of settings and at various levels of healthcare delivery. Due to its simplicity and flexibility, this model has been accepted as the most commonly used quality-of-care framework (Ghaffari, Jahani Shourab, Jafarnejad, Esmaily, & Health, 2014). The study of value-based payment and

patient-centered outcomes also stem from Donabedian's SPO framework (Ayanian & Markel, 2016). The model has been used to assess and compare the quality of healthcare organizations (Agency for Healthcare Research and Quality, 2015b) and for determining structure and processes considerations for improving the quality of chronic disease management (Ameh, Gómez-Olivé, Kahn, Tollman, & Klipstein-Grobusch, 2017; Lawson & Yazdany, 2012; Lemmens et al., 2008). The Donabedian model may also be used to alter structures and processes within a healthcare delivery unit (McDonald et al., 2007). Medicare also uses measures drawn from the SPO model to assess hospital quality (Ayanian & Markel, 2016).

**Systems Engineering Initiative for Patient Safety (SEIPS) Model**. The SEIPS is a multidisciplinary research program that operates out of the Center for Quality and Productivity Improvement located at the University of Wisconsin-Madison (Center for Quality and Productivity Improvement, 2018). The program was funded by the Agency for Healthcare Research and Quality (AHRQ), and its main focus is systems and job design, human factors engineering, quality management, and the introduction of technology affecting patient safety and organizational and employee outcomes (Center for Quality and Productivity Improvement, 2018). The SEIPS model of work system and patient safety originates from the Donabedian Quality of Care model and is one of several human factors engineering (HFE) models. Similar models have been described, such as Reason's Organizational Accident Model dealing with human error (Reason, 2000) and the Haddon Matrix for injury prevention (Runyan, 2015) but these models are not described as they fail to detail specific components within a system that lead to adverse events and errors. The HFE approach to safety was first introduced by Chapanis and Safrin (1960) in a study on identifying the human factors involved in a medication error. Human factors research is focused on how various human physical characteristics, human

cognitive characteristics, and human interactions in the workspace influence the occurrence of errors (Russ et al., 2013). HFE strives to discover the problems that exist within a system and create modifications, such as technology implementation or alteration and process changes within the system to improve outcomes (Russ et al., 2013). The SEIPS model originated from the industrial engineering subspecialty of human factors research (Carayon et al., 2006).

The SEIPS focuses on the *work system*, or an organization's structure that is comprised of the *persons*, *tasks*, *tools and technologies*, *environment*, and *organizational conditions* and how these factors affect *processes* and *outcomes*. A tenet of this model is that the *work system* is always striving to maintain a state of equilibrium where harmful elements of the system are balanced out with the positive aspects of the system (Carayon & Smith, 2000). A *person* may be an individual, such as a healthcare provider or patient, or a collective group of people including surgical teams and families that carry out tasks (Carayon et al., 2006). It has also been proposed that *persons* should be inclusive of both patients and healthcare professionals (Holden et al., 2013). *Tasks* are actions that take place within larger *work processes*, such as the use of skills, autonomy, and employment demands (Carayon et al., 2006). *Tasks* are carried out by using *tools and technologies* like electronic health records and medical devices. The *environment* consists of physical characteristics of the workplace environment such as workspace design and noise, and *organizational conditions* which are structures external to people (Carayon et al., 2006).

In the SEIPS model, a *process* is how care has been provided and managed. The SEIPS model is unique in its inclusion of care processes external to the direct delivery of health care within a *work system* and such as maintenance and housekeeping (Carayon et al., 2006). The *work system* and the *process* work together to influence the *outcomes* of care. The direction of influence is bidirectional among the various concepts. The *work system* in which care is provided

affects *processes*, which influence patient, employee, and organizational *outcomes. There is a feedback loop linking processes back to work systems and outcomes back to work systems. These feedback loops are primary areas of interest for examining new work designs or developing redesigns within the system.*

**The Outcomes Production Model.** The Minnick and Roberts Outcomes Production Model (A. Minnick, 2001) is a conceptual framework influenced by the systems theory. The framework was developed in 1991 (Oberlies, 2016) and its underlying assumption is that specific resources must be present within organizations for them to attain better outcomes (A. Minnick, Young, & Roberts, 1995). The model has been used in several publications (Maxwell, Mion, Dietrich, Fallon, & Minnick, 2014; A. Minnick, 2001) as well as, many doctoral dissertations (Barnett, Minnick, & Norman, 2014; Fisher, 2010; Cathy A Maxwell, 2012; Moore, 2017; Oberlies, 2016; Widmar, 2012).

The Outcomes Production Model considers three variables; *capital inputs*, *organizational facets*, and *employment terms* which influence *labor inputs*, *employee attitudes*, and *employee behaviors* (Figure B1). *Capital inputs* are items that require corporate investment through fiscal spending (Cathy A Maxwell, 2012). Examples of *capital inputs* within the context of the perioperative setting are anesthesia monitors and devices and surgical supplies necessary to perform procedures. *Organizational facets* are comprised of the working environment and organizational structures (Cathy A Maxwell, 2012). Institutional policies and procedures represent an example of *organizational facets*. Finally, *employment terms* are defined as the specifics regarding an employee's job description, employment expectations, compensation, and working hours (Cambridge Dictionary, 2018).

*Labor inputs* are measures of the number and characteristics of healthcare providers. The units of measurement for the number of providers can be simplified to the number of employees and the total number of hours those employees work (Denison, 1961). Examples of *labor input* quantity are the number of full-time anesthesia providers and recovery room nurses. The quality of the *labor inputs* is described by attributes possessed by the workforce, such certification from a credentialing body and the amount of clinical experience an employee has. *Employee attitudes* represents how an employee thinks about situations which, in turn, affects this employees' behavior (Saari & Judge, 2004). *Employee behavior* can be described as specific actions taken by an employee in response to a stimulus (Saari & Judge, 2004). The concept of *patient experience* is defined as interactions that patients have within the health care system with healthcare staff and other facilities (Agency for Healthcare Research and Quality, 2016). *Patient characteristics*, as defined previously in this exam, are also uniquely considered in the Outcomes Production Model.

The relationship between the nine variables in the Minnick and Roberts Model is such that *capital inputs*, *employment terms*, and *organizational facets* act to influence *employee attitudes* and *labor inputs*, which in turn, affect *employee behavior* in a linear fashion. *Capital inputs* also have a unidirectional relationship with the concept of *employee behavior*. The idea of *patient characteristics* has a unidirectional relationship with *employee attitudes*, *patient experience*, and *outcomes*. *Patient experience* also has a direct connection with *outcomes*. The *outcomes* concept also appears to have a feedback loop leading to the original initial concepts of *capital inputs*, *employment terms*, and *organizational facets*.

**Framework Used for This Study**

The Minnick and Roberts Outcome Production Model (A. Minnick, 2001) provides the theoretical framework for this dissertation study (Figure B1). The framework suggests that specific resources must be present within organizations for them to attain better outcomes (A. Minnick et al., 1995). This model considers three variables; *capital inputs*, *organizational facets*, and *employment terms* which influence *labor inputs*, *employee attitudes*, and *employee behaviors. Patient characteristics* is another unique variable included in the Minnick and Roberts Outcome Production Model. In this model, *patient characteristics* influence *patient experience*, *employee attitudes*, and outcomes.

Although the Minnick and Roberts Outcome Production Model has not been used to study the provision of perioperative care or outcomes within the context of ASCs, the model has been used in nearly 30 studies examining a variety of phenomena. The model has been used in several publications (Maxwell et al., 2014; A. Minnick, 2001; A. Minnick, Fogg, Mion, Catrambrone, & Johnson, 2007; A. F. Minnick et al., 1997) as well as, many doctoral dissertations (Barnett et al., 2014; Fisher, 2010; Cathy A Maxwell, 2012; Moore, 2017; Oberlies, 2016; Widmar, 2012). The Outcomes Production Model has many strengths including its adaptability to all types of healthcare delivery settings and organizational structures. The model is logically adequate, and the potential interactions between its concepts are well-considered. Another advantage of the framework is that it differentiates between *administratively mediated variables* which are controllable at an organization's administrative level and those variables that cannot be changed by administrator involvement (A. Minnick et al., 2007). A significant advantage to this model is the role that *patient characteristics* play in *outcomes*. This concept is not considered in other systems models, even though various patient characteristics have been found to affect healthcare outcomes (Gonzalez-McQuire, Hensen, Spoorendonk, & Alleman,

2015; Pasquali et al., 2015; Vogl, Wilkesmann, Lausmann, Hunger, & Plötz, 2014). This aspect of the framework is important because healthcare service designs are frequently standardized and not tailored to patients based on individual characteristics, which are often necessary to achieve positive quality outcomes (Minnick, et al., 1997).

The variables used in the Minnick and Roberts Outcome Production Model closely align with concepts and sub-concepts addressed in the aims of this dissertation (Table A1). For example, sub-concepts, such as *temporal conditions* and *workload requirements*, pertaining to the broader concept of *working conditions* for this dissertation, fall within the framework of *employment terms* in the Minnick and Roberts Outcomes Production Model. The concept of *workload requirements*, as discussed later in this chapter, may also be influenced by *patient characteristics* with regards to patient assignment to nursing personnel. *Labor quantity* is another sub-concept of interest for this dissertation study which corresponds to one aspect of the broader concept of labor *inputs* considered in the Outcomes Production Model. Similarly, the proposed concepts of *working conditions* and *anesthesia delivery structure* are similar to work environment and organizational structures which would fall under the *organizational facets* concept pertaining to the Minnick and Roberts Outcomes Production Model.

The Outcomes Production Model also possesses some potential disadvantages. The primary drawback to this model is its complexity. The model includes nine variables with various relationships and potential hypotheses to consider (Figure B1). This attribute makes it challenging to address all variables in one dissertation study. The aspects of the Minnick and Roberts Outcomes Production Model to be addressed in this study will be organizational facets, employment terms, labor inputs, and patient characteristics under the proposed dissertation concepts discussed above.

## 2.2 Literature Review

A literature review was performed to examine how state regulation may impact anesthesia care, if at all. A search was conducted using PubMed and Medline using the terms "state regulation" and each of the following terms: "anesthesia care," "anesthesia services," and "anesthesia." No search limit was applied for the year of publication; however, publications were limited to those that were available in the English language, as full-text documents, and publications focusing only on human subjects. This search yielded no results, and another search was performed using "state law" in conjunction with each of the terms "anesthesia care," "anesthesia services," and "anesthesia" using the same search limitations. Only one literature review was retrieved with this search which was aimed toward the examination of targeted regulation of abortion providers (TRAP) laws. This review was not deemed relevant as it excluded laws dealing with general anesthesia noting that non-hospital settings rarely used in outpatient abortion procedures (Jones, Daniel, & Cloud, 2018). This study also sought to examine laws specific to abortion procedures which are often a separate set of laws from standard ASC state regulations (Jones, Daniel, & Cloud, 2018). No existing study was found showing the impact of state regulation on non-hospital settings concerning anesthesia care, generally.

Another search was performed to explore the potential effect of organizational policy on anesthesia care in the ASC setting. Using PubMed and Medline the phrases "institutional policy" and "institutional standard" were applied individually with each of the following terms: "ambulatory surgery" and "ambulatory surgical." Any full-text publications available in the English language were considered. The search only resulted in only one US study which was restricted to examining institutional pre-operative fasting guidelines (Pandit, Loberg, Pandit, &

Analgesia, 2000). Pandit and colleagues (2000) conducted a national study surveying 1869 Society for Ambulatory Anesthesia members to inquire on institutional fasting guideline practices. The research showed that 62% of respondents had an institutional policy which permitted patients to consume clear liquid up to two hours before anesthesia induction time and 35% reported institutional policies allowing patients to eat a light meal up to six hours before anesthesia delivery (Pandit et al., 2000). No literature search results were found examining the effect of any institutional policies or standards on the actual delivery of anesthesia care in the ambulatory setting.

A search was performed through PubMed using the term "failure to rescue". A 10-year search limit was applied to publications that were made available through free full text and focused only on humans. A total of 948 manuscripts were retrieved, of which, 60 studies were identified which utilize FTR as an outcome of interest within the hospital setting. No studies examining FTR were identified in non-hospital settings. The majority of the retrieved studies were noted to be descriptive, primarily employing a retrospective approach examining overall rates of FTR. Two studies were found to use a longitudinal approach (Chau et al., 2015; Moriarty et al., 2014) one of which involved an intervention; implementation of a rapid response team (Moriarty et al., 2014). Of note, the study performed by Moriarty et al. (2014) was the only intervention study that was found to relate to any aspect of the phenomenon of interest.

Few studies employed a prospective design approach and most of these have been cross-sectional studies (Ahmad et al., 2017; L. Aiken, Shang, Xue, & Sloane, 2013; Carthon et al., 2012; Chung et al., 2017; Ghaffari et al., 2014; Holena et al., 2016; Kutney-Lee et al., 2015; Neff, Cimiotti, Sloane, & Aiken, 2013; Van den Heede et al., 2009). Three studies utilizing prospective cohort design were retrieved (Glance et al., 2013; Joseph et al., 2016; Khan et al.,

2017). Two matched-group design studies (Friese, Xia, Ghaferi, Birkmeyer, & Banerjee, 2015; Khan et al., 2018) and one quasi-experimental interrupted time series design were also retrieved from the search (Volpp et al., 2009). A single study was found identifying adverse events and FTR through patient safety indicators in an inpatient plastic surgery setting (Hernandez-Boussard, McDonald, Rhoads, & Curtin, 2015). No study considering FTR as an outcome of interest was conducted in any surgical environment outside of the hospital setting.

Limited studies have examined the characteristics and nature of adverse events within the context of non-hospital settings. A literature search was also performed to investigate studies conducted on adverse events in the ambulatory surgery setting. PubMed and Medline search engines were used to locate publications. The terms “adverse event” and “ambulatory surgery” were entered using English language, full-text, and ten-year time as limits. A total of 26 publications were retrieved, of which four studies were found to be relevant to the occurrence of general adverse events (Keyes et al., 2008; Mull et al., 2018; Starling et al., 2012; Theissen, Fuz, Bouregba, Autran, & Beaussier, 2018). All of these articles used a retrospective approach. Another search was performed under the same limits on PubMed and Medline using the terms “adverse event” and “outpatient surgery” in an attempt to generate additional publications. A total of 15 publications were retrieved. Once duplicates were removed, only one additional relevant article was found which was a study that was performed for the development and validation of an adverse event surveillance tool for the veteran population undergoing outpatient surgery at veteran hospitals (Mull, et al., 2018).

A final literature search was performed using PubMed, Medline, and CINAHL to examine studies adressing relevant variables conatined within the Outcomes Production model as they pertain to ASCs. The following variables were serached: employmenty terms,

organizational facets, nursing work conditions, nurse staffing, and nursing functions. The search resulted in one publication which discussed best practices for scheduling surgical procedures and necessary staff in ASCs (Pash, Kadry, Bugrara, & Macario, 2016). The article primarily focused on procedural scheduling, rather than ASC staffing, to ensure optimal operating room utilization and minimize case delays and turnovertime between surgical procedures. The electronic search was further expanded to an internet search to determine the presence of existing survey research in the context of ASCs and these relevant variables. It was noted that Leapfrog had conducted the first annual ASC survey on patient safety.

Although no publications were located on electronic journal databases, the Leapfrog website contained only aggregate data information obtained from this study. The Leapfrog survey sought participation from both ASCs and hospital outpatient departments (HOPDs). The preliminary findings were based on data provided from 321 ASCs and 1,141 HOPDs that participated in the survey. Although the survey was open to outpatient facilities in all 50 states using the CMS ASC database, information regarding specific data on response rates by state or region were not disclosed. This study did not specifically address concepts related to employment terms, nurse staffing, nursing functions, or nursing work conditions, but some key findings were observed that are relevant to this dissertation work. Initial results concluded from this survey specific to ASCs were gaps in provider training and national certifications, evidence that ASCs lag behind HOPDs with regard to implementing best practices for patient safety, and that patients generally showed higher patient experience ratings for services rendered at ASCs when compared to those undergoing procedures at HOPDs.

## 2.3 Critical Review of the Literature

### Key Concepts Related to the Phenomenon

**Perioperative outcomes.** The concept of healthcare outcomes is essential to healthcare because outcome measures provide one method for assessing the quality of health care organizations and the delivery of care (Agency for Healthcare Research and Quality, 2015b). Outcome measures may help to highlight the effect of health care services or medical interventions on patient populations when proper risk-adjustment has been performed to account for unique population attributes (Agency for Healthcare Research and Quality, 2015b; Kane & Radosevich, 2011). Patient-level healthcare outcomes may be expressed in myriad ways such as survival, quality of life, physiological outputs, functional measures, and satisfaction of care and may employ the use of generic or condition-specific measures (Kane & Radosevich, 2011).

Some commonly cited outcome measures are the length of hospital stay, hospital readmissions, acquisition of hospital-acquired infections, the occurrence of adverse events, emergency room admissions, mortality, timeliness of care, and patient care experience (Tinker, 2016). In addition, several medical conditions such as heart failure, stroke, and traumatic brain injury have well-established outcomes of interest and measures used to quantify these diseases (Kessel, Boer, Hendriks, & Plass, 2017; Lin, Fu, Wu, Hsieh, & Outcomes, 2011; Polinder, Haagsma, van Klaveren, Steyerberg, & Van Beeck, 2015). However, there is no consensus within anesthesia and perioperative research regarding the most important outcomes to research or how these outcomes should be measured (Boney et al., 2015; Boney, Moonesinghe, Myles, & Grocott, 2016; Murphy, 2012).

Several considerations can contribute to this lack of agreement. These include how the perioperative period itself is defined in the research, the various provider types involved in perioperative care, and the process for risk-adjustment within patient populations. The concept of the perioperative period can be described in three distinct phases. The preoperative phase is a

period that begins days before surgery up to the point of surgical incision (Katz, 2003). The intraoperative period includes the time from surgical incision until surgical wound closure (Katz, 2003). The postoperative period is the final phase of the perioperative period and involves the time from the end of surgery up until days after operation (Katz, 2003). The ambiguity of a clear time-endpoint in the postoperative period may undoubtedly affect outcome measurement in the research. For example, one researcher may be interested in measuring postoperative outcomes noted in the hospital before discharge, while other researchers may have defined the postoperative period as a timeframe of seven or 30 days after surgery. How the postoperative period is defined plays a significant role in some of the variation seen in where and how outcomes are measured.

The perioperative outcomes selected for investigation are often influenced by the healthcare service involved in the research. For example, outcomes examined in the studies performed by surgeons vary based on the types of surgery performed and may include unique conditions and surgery-specific outcomes. Also, because the administration of anesthesia is typically involved during the perioperative period, the field of anesthesia has its own set of outcomes of interest. These outcomes include death, myocardial infarction (MI), organ dysfunction, pneumonia, pain, and nausea and vomiting (Fleisher, 2010). The time-frame of interest for anesthesia outcomes research has long been noted be within the 24 to 48-hour postoperative mark, but studies have shown that anesthesia has the potential to affect outcomes up to one year or longer after surgery (Fleisher, 2010) . The way these potential outcomes are also defined impacts how measurement is performed in each study. As a result, measures such as mortality and severe morbidity are broad perioperative outcomes that can be found in most of the available literature, although measured using a variety of distinct tools. Recently, interest has

also peaked with regards to patient-oriented outcomes such as postoperative quality of life, quality of surgical recovery, and patient satisfaction (Orav, Tsai, & Jha, 2015).

**Institutional policies.** Healthcare institutions are places that provide either short or long term health care (US Legal, 2016). Each state has adopted descriptors for health care institutions, but most states agree these institutions are facilities, buildings, or agencies that provide medical, nursing, supervisory, or other health-related care. As such, institutions are also referred to as healthcare facilities and differentiated by the type of facility is, for example, hospitals, clinics, or outpatient healthcare centers (US National Library of Medicine, 2017; World Health Organization, 2018). A policy is a high-level strategy designed by a governmental or supervisorial body aimed toward accomplishing accepted goals and actions (Merriam-webster, 2018a). Policies are also defined within healthcare as officially or authoritatively made resolutions that are used to inform decision-making, activities, or behaviors (Longest, 2016). Institutional policies are formal, written principles or guidelines adopted by an organization in efforts to attain specific pre-defined goals (Business Dictionary, 2018). They are guidelines for achieving goals and accepted practices by an institution. These principles are established by individuals occupying official positions within an institution, such as managers and executives.

Healthcare institutional policies are those agreed upon approaches aimed at determining decisions and actions for the provision of safe, successful healthcare services. Policies work in concert with procedures which are detailed methods of active policy application in daily efforts (Business Dictionary, 2018; Merriam-webster, 2018b). Institutional policies and procedures serve many functions, such as promoting adherence with professional standards of practice, compliance with state and national policies, and conformity with accreditation requirements,

where applicable (Irving, 2014). These policies also help to standardize professional practice among healthcare professionals within a single institution or across a group of institutions.

**Non-hospital surgical setting.** A hospital is a facility that has organized medical and professional staff prepared available to deliver healthcare 24 hours a day for seven days a week, including inpatient, acute, convalescent, and terminal care (World Health Organization, 2018). Non-hospital settings include institutions that are not owned by or affiliated to a hospital. Generally, these facilities include free-standing ambulatory settings, dialysis clinics, public health clinics, outpatient surgical clinics, nursing homes, and medical, nursing, and dental offices (Handelman, 2012). The terms "outpatient," "ambulatory," and "same-day" settings are terms often used to describe healthcare settings outside of the hospital (Annolino, 2012).

Non-hospital surgical settings can be described as any setting where surgical procedures take place that is not owned by or operated by a hospital. Some of these settings include free-standing ambulatory surgical centers, often referred to as outpatient surgery centers, and specialty surgery centers (Stanford Health System, 2018). Same-day surgeries may also be performed in a physician or dentist's office (Stanford Health System, 2018). Specialized surgical centers are another type of non-hospital surgical setting where specialists offer care and perform surgeries within a dedicated area of medicine (Commons, Halperin, & Chang, 2001). For example, a medical specialty such as orthopedics would only offer surgical procedures limited to bones and joint operations. Another key feature of non-hospital surgical locations is that operations planned at these settings are those in which admission to the hospital is not expected (Steiner, Karaca, Moore, Imshaug, & Pickens, 2006).

**State regulation.** Regulations are laws that have been created by administrative agencies and are typically authorized by a statute (Farnsworth Baker, 2016; Longest, 2016). Regulations

are generally developed and enacted through a rule-making process, and they are designed to increase efficiency in the operation of laws. State regulations represent rules established at the individual state-level to control activities and processes. In the context of the dissertation, state regulation represents rules or regulations placed on non-hospital surgical settings concerning how these facilities should operate.

**ASC regulatory oversight.** A review was conducted to examine the present status of state licensure and accreditation of ASCs in the United States. This procedure was done systematically by sorting individual states and the District of Columbia alphabetically and applying relevant search terms to each state. The approach used to locate state regulations was an internet search using the Google Search Engine with the following terms: "ambulatory," "outpatient," "free-standing" and "surgical center," "surgical facility," and the terms "regulation," "legislation," or "rules" and the name of each state, including the District of Columbia. The most recent information from official state legislation documents was considered. Additional inclusion criteria consisted of the presence of information specific to ASCs not functioning as an extension of a hospital, legislation specific to state licensure requirements and procedures for ASCs, and information regarding requirements for ASC third-party accreditation or federal certification. Items excluded from this review were legislation only relevant to hospitals, hospital-affiliated ASCs, abortion centers, office-based settings, or any outpatient facilities where an anesthesia provider does not provide services for procedures. A second Google search was conducted to ascertain the number of federally-certified ASCs in the United States by using the terms "surgical center," or "surgery center" with the term "certified" and "per state" and "by state."

The literature review revealed that the nature and extent of regulatory oversight for ASCs vary from state to state. The majority of states mandate state-level licensure for the provision of

services in a freestanding ambulatory surgery setting. A total of 47 states, including the District of Columbia, require a license awarded by varying state departments to operate a non-hospital affiliated ASC (Table A1). While most states require a state license, the specific Department charged with the task of licensing these facilities rests mostly on the state. Length of licensure was also inconsistent across states, with some requiring no renewal and others requiring license renewal annual or every two or three years. The most significant finding of this review was the variation in state-level regulation pertaining to third-party accreditation. Some state Departments mandate accreditation from nationally-recognized, or in some cases, specific accreditation agencies. Other state Departments will accept an accreditation survey in lieu of state inspections, whose timing and frequency is also based on individual state legislation. The remaining states do not include language addressing whether or not accreditation may allow an ASC to attain a deemed-status concerning state licensure renewal inspections. Only three states appear to require federal-certification for ASC operations; however, other states were noted to accept CMS-approved accreditation agencies as a proxy for achieving federally-deemed status. Additionally, state CON-program participation and population size do not entirely explain why some states possess a greater number of CMS-certified ASCs than others.

**Licensure.** The concept of licensure refers to the process of having applied for and obtained a state-specific license for operating a non-hospital surgical setting. A review of the literature performed by the examinee shows that the majority of states mandate state-level licensure for the provision of services in a free-standing ambulatory surgery setting. A total of 47 states, including the District of Columbia, require a to operate a non-hospital affiliated ASC (Table A1). Duration of licensure and designated renewal times also differs by state. Of the 47 states including the District of Columbia requiring licensure, 29 states mentioned the need for

ASCs to obtain annual license renewal to remain in compliance. Several of the rules requiring yearly renewal list specific language regarding the length of the licensure.

One stipulation for initial state licensure, and in most cases license renewal, is a completed inspection with passing results. A designated department typically conducts these inspections for each state. However, several states have acknowledged ASC accreditation by an approved accreditation body and will accept surveys performed by these agencies instead of a state inspection (Table A1). Such reviews have been designed to show compliance with nationally-accepted standards for the manner, quality, and environment of care (Accreditation Commission for Health Care, 2015). Office-based surgical settings may also be required to or may voluntarily elect to obtain state licensure. State licensure in non-hospital settings is not a requirement in all states, and state government websites do not always contain information regarding the possible nuances of this process.

**Accreditation.** Accreditation is a review process that allows healthcare institutions to display their capability of meeting certain standards and regulatory requirements created by a recognized accreditation body (Accreditation Commission for Health Care, 2015). The Ambulatory Surgery Center Association lists the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF), Accreditation Association for Ambulatory Health Care (AAAHC), Healthcare Facilities Accreditation Program (HFAP), Institute for Medical Quality (IMQ), and the Joint Commission (JCAHO) as the most common CMS-approved accreditation bodies (Ambulatory Surgery Center Association, 2012). Each of these agencies varies in their missions, visions, and specific processes and standards, but all aim to examine the quality of care delivered at ASCs. The PI's review of the literature depicted that overall ASC regulations were likely to vary by the state concerning the necessity of facility accreditation.

**Certification.** The concept of certification, as it relates to non-hospital settings, refers to the process of applying for and obtaining a certification status from the. CMS-certification allows healthcare facilities to participate in a CMS payment plan in which specific surgical procedures performed under a particular set of procedures can be reimbursed for services by CMS. Under the US Code 42 CFR, two primary requirements must be met for an ASC to participate in the CMS payment program. The first condition is that the ASC must meet the definition set forth by CMS as a facility offering surgical services not requiring hospitalization in which patients are discharged within 24-hours of initial admission. In addition to this prerequisite, the ASC must have an official agreement which has been signed by an authorized ASC representative and filed with CMS (US Code 42 CFR). CMS also lists specific conditions for coverage including compliance with existing state licensure mandates and the establishment of a governing body who shall initiate and monitor compliance with facility policies and procedures (US Code 42 CFR). This includes contracts with other entities for the provision of off-site healthcare services, protocols and existing written transfer agreements with a CMS-participating hospital for patients requiring care beyond the ASC's scope, and verifying that all ASC surgeons retain hospital admitting privileges (US Code 42 CFR).

Certain conditions must also be met for surgical services, including the performance of an anesthesia evaluation and administration of anesthesia by an anesthesiologist or Certified Registered Nurse Anesthetist (CRNA) in alignment with state scope of practice laws (US Code 42 CFR). Also, a post-operative patient assessment by a physician CRNA before discharge from the ASC must be performed (US Code 42 CFR). Additionally, certified ASCs must initiate and monitor quality and performance improvement programs designed to measure and improve quality indicators, infection control practices, and the incidence of adverse events (US Code 42

CFR). Detailed environmental conditions such as physical environment, building safety, fire safety, and the presence of emergency equipment and personnel trained in emergency equipment use and cardiopulmonary resuscitation must also be met for certification (US Code 42 CFR). Additional conditions pertaining to medical staff, nursing services, medical record maintenance, written notice of patient rights and responsibilities, and presence of infection control programs and disaster preparedness programs must also be met (US Code 42 CFR).

ASCs may also voluntarily elect to participate in the CMS program to receive federal payment for services rendered. CMS recognizes federally-deemed compliance status for qualifying for a certification-agreement. If an ASC wishes to acquire this status, it must be licensed by a state agency or be accredited by a national accrediting entity that has been approved by CMS as meeting its program's standards (US Code 42 CFR). Certification is conducted by either state-level agencies or CMS-approved accrediting agencies, both of which must conduct survey inspections. CMS depends on these agencies to ensure that ASCs meet the conditions for certification.

**Anesthesia delivery structure.** Anesthesia involves the administration of a medication aimed at temporarily reducing a patient's level of consciousness, pain perception, voluntary and involuntary movement, and autonomic function (Barash, 2009). Anesthesia is administered by an anesthesiologist, a CRNA practicing autonomously, a CRNA practicing in a medically-directed or medically-supervised model, or an anesthesia assistant (AA) working under the supervision of an anesthesiologist. Several anesthesia provision models exist including the care-team, all-MD, all-CRNA, and MD-CRNA models. In the care-team model, anesthesiologists supervise CRNAs, AAs, and resident physicians in training who are administering the anesthetic (American Association of Nurse Anesthetists, 2018). An all-MD model is made up of all MDs who give

their own anesthetics, while an all-CRNA model is characterized by anesthesia care provided by CRNAs acting independently without an anesthesiologist (American Association of Nurse Anesthetists, 2018). Finally, the MD-CRNA model is similar to the care-team model but with fewer supervision requirements, allowing CRNAs to function to their full scope of practice (American Association of Nurse Anesthetists, 2018).

Anesthesia care may be described as anesthesia activities and perioperative care functions performed by an anesthesia provider. The American Association of Nurse Anesthetists (AANA) has provided standards for CRNA practice that speak to these activities. These standards include performing a pre-anesthesia patient assessment and evaluation, obtaining anesthesia informed consent, developing a patient-specific anesthesia care plan, and implementing and adjusting this plan as needed for the patient's condition (American Association of Nurse Anesthetists, 2013). Another important aspect of anesthesia care is the continual assessment of how the patient responds to the anesthesia being provided, as well as the surgical intervention (American Association of Nurse Anesthetists, 2013). Also, continuous monitoring of oxygenation, ventilation, cardiovascular status, thermoregulation, neuromuscular blockade, and positioning is required until the responsibility of patient care has been transferred a capable provider when it is safe to do so (American Association of Nurse Anesthetists, 2013). Nurse anesthetists must intervene, as needed, to ensure the safety of the patient. Continual patient observation and vigilance are the cornerstones of anesthesia care (American Association of Nurse Anesthetists, 2013). CRNAs must ensure that all anesthesia equipment necessary for surgery is available and that it has been adequately checked for use (American Association of Nurse Anesthetists, 2013). Finally, CRNAs must respect and uphold patient rights and take part in evaluating anesthesia quality of care (American Association of Nurse Anesthetists, 2013).

## Variables Affecting Adverse Events

Baseline health status and fitness-level of patients undergoing surgery have been cited as critical determinants of postoperative adverse outcomes (Moonesinghe, Mythen, & Grocott, 2009). Adverse events such as postoperative cognitive dysfunction, cardiopulmonary compromise, MI, renal failure, infection, bleeding, disability, and death have been reported following surgical procedures. As surgical interventions become more complex, it is important to consider patient factors that may potentially contribute to the occurrence of postoperative adverse events.

**Comorbid illnesses.** Comorbidities are defined as diseases that have unrelated causes (Iezzoni, 2013). Comorbidities represent one patient-related factor in the development of a perioperative adverse event (Charlson et al., 1989). Those individuals diagnosed with multiple comorbidities are also at higher risk for death and complications (Iezzoni, 2013). Kent and colleagues (2014) exhibited several disease states that evidenced a statistically significant contribution to the occurrence of perioperative adverse events for patients undergoing ambulatory surgery. The study found that chronic obstructive pulmonary disease represented the greatest patient-related risk factor for these surgeries (Kent, Metzner, & Bollag, 2014). The research showed patients who had experienced a prior cerebrovascular accident or transient ischemic attack, had a previous percutaneous intervention or cardiac surgery, had a body mass index greater than 30 or had hypertension were more at risk for adverse events (Kent et al., 2014). The five most frequent adverse events were impaired wound healing, reintubation, postoperative pneumonia, bleeding necessitating blood transfusion and death within three days of surgery (Kent et al., 2014). Other studies have noted that patient history of a prior MI, congestive heart failure (CHF), or ischemic heart disease are at higher risk of suffering a perioperative

adverse event (Healy et al., 2010; Sunny, Kumar, Kotekar, & Desai, 2018). Hypertension has also been shown to predict the occurrence of all intraoperative event, including cardiovascular events (Chung, Mezei, & Tong, 1999). The presence of baseline hypertension, diabetes mellitus, or renal failure contributes to an increased incidence of perioperative ischemia, MI, cardiac death (Chung et al., 1999).

Diabetes mellitus may result in several types of perioperative adverse events. Diabetes is noted to adversely affect surgical outcomes of patients with or without positive cardiac history (Bower et al., 2010). Diabetes has been cited to increase postoperative 30-day mortality and complications in patients undergoing in-hospital noncardiac surgeries and is identified as an independent determinant for risk of complications and death with cardiovascular surgeries (Yeh et al., 2013). Specifically, diabetes is noted to increase the risk of acute renal failure in noncardiac surgery patients (Yeh et al., 2013). Mathew and colleagues (2008) indicated that there was a graded relationship with regards to severity of pre-existing renal failure and the occurrence of adverse events, namely cardiovascular events and death.

Researchers have noted that chronic kidney disease was an independent risk factor for postoperative mortality and surgical patients undergoing dialysis treatment were at the highest risk for an event (Mathew et al., 2008). Patients receiving dialysis treatments, or those patients with a history of stroke, ischemic heart disease, or COPD are at further risk of postoperative mortality for patients with diabetes than those without diabetes (Yeh et al., 2013). These events have been appreciated across different surgical disciplines. Bamba and colleagues (2016) examined data on 129,007 patients enrolled in a private aesthetic surgery insurance database and found that diabetes was an independent risk factor of adverse events, including pulmonary and

infectious events following plastic surgery procedures (Bamba, Gupta, Shack, Grotting, & Higdon, 2016).

Obese patients are also at a risk that is seven times higher of developing diabetes than those who are not obese (Gatineau et al., 2014). Obesity alone is associated with higher incidence of complications and adverse events related to aesthetic surgery (Abboushi, Yezhelyev, Symbas, & Nahai, 2012; Sieffert, Fox, Abbott, & Johnson, 2015). Obese patients may present with difficult airways and may often have obstructive sleep apnea. Sleep apnea places postsurgical patients at a much higher risk for oxygen desaturation and acute respiratory failure (Bamba et al., 2016; F. Chung, Mezei, & Tong, 1999; Seet, Chua, & Liaw, 2015). Seet et al. (2015) found that patients with sleep apnea had a one-in-four incidence of adverse events, including postoperative airway issues and unplanned intensive care unit stays during the perioperative period.

Chronic obstructive pulmonary disease (COPD) has also been noted to increase the risk of perioperative adverse events (Budithi, Dolinski, & Hollingsworth, 2018; Genovese, Fish, Chaer, Makaroun, & Baril, 2017; Rosen, Geraci, Ash, McNiff, & Moskowitz, 1992; D. H. Stone et al., 2013). These events have been cited to be most notable with respiratory and vascular surgeries (Genovese et al., 2017; D. H. Stone et al., 2013). A variety of respiratory diseases may be broadly categorized as COPD. These respiratory diseases include chronic bronchitis, emphysema, and chronic obstructive asthma. COPD increases the likelihood of postoperative pulmonary adverse events, such as pneumonia, need for reintubation, and prolonged intubations of greater than three days (Budithi et al., 2018). COPD has also been linked to increased length of hospital stay and higher postoperative mortality rates (Budithi et al., 2018; Genovese et al., 2017; Rosen et al., 1992; D. H. Stone et al., 2013).

***Measuring existing comorbid illness.*** There are several existing measures for the existence and severity of disease states. Two commonly used and supported generic measures for the existence of comorbidity are the Charlson Comorbidity Index and the Elixhauser comorbidity score. The Charlson Index has been cited as the most widely used generic comorbidity measure (Iezzoni, 2013). Charlson and colleagues (1987) developed and validated the Charlson Comorbidity Index as a measure for the impact of comorbid disease on mortality. The original measure included 19 disease conditions identified through hospital abstracts of disease classification codes and assigned scores to relative risks for these diseases to result in one single summary score (Charlson, Pompei, Ales, & MacKenzie, 1987). The Charlson Index was later modified to include 17 categories which were assigned based on hospital International Classification of Diseases coding (Deyo, Cherkin, & Ciol, 1992). Many modifications of the measure exist with varying weight-assignments (D'Hoore, Bouckaert, & Tilquin, 1996; Deyo et al., 1992; Halfon et al., 2002; Kastner et al., 2006; Quan et al., 2011; Romano, Roost, & Jollis, 1993). Weighted-comorbidity scores have also been established for ambulatory care (Kane & Radosevich, 2011).

The Elixhauser comorbidity score is another generic comorbidity measure that assigns weights to each comorbidity based on multivariable modeling (Elixhauser, Steiner, Harris, & Coffey, 1998). Elixhauser and colleagues (1998) used coded administrative hospital discharge data to come up with 30 comorbidities that correlated with length of stay in the hospital and hospital death (Kane & Radosevich, 2011). The measure has been used extensively in epidemiologic and health services research and has more flexibility and extensive use across many different situations and outcomes (Iezzoni, 2013). Criterion validity of the Elixhauser comorbidity score has been shown to be superior to that of the Charlson Comorbidity Index

(Iezzoni, 2013), but both of these measures have demonstrated prognostic validity (Kane & Radosevich, 2011).

Another comorbidity measure often used by anesthesia providers to determine preoperative patient comorbidities is the American Society of Anesthesiologists Physical Status Classification (ASA-PS). The ASA-PS assigns one score which indicates the effects of all comorbid conditions and is used to measure general health status (Iezzoni, 2013). ASA-PS scores initial range was from one to five, where a PS score of one indicates a healthy patient with no comorbidities and a PS score of five indicates a patient who is close to death and not expected to survive the surgical procedure (Owens, Felts, & Spitznagel, 1978). A classification score of two is assigned to patients with a mild systemic disease, a score of three to those with severe systemic illness, and a score of four to patients with severe systemic disease that presents a threat to life (Owens et al., 1978). In 1980, a final PS score of six was added to represent patients that are brain-dead whose organs will be surgically harvested for donation (Fitz-Henry, 2011). The prefix "E" added to the numerical classification indicates an emergency surgery (Fitz-Henry, 2011).

One study compared the Charlson Comorbidity Index and the ASA-PS as a measure for comorbidity when examining mortality, hospital stay, and 28-day readmission (Dobbins, Badgery-Parker, Currow, & Young, 2015). Dobbins and colleagues (2015) did not find the measures had a strong correlation. This finding elicits the idea that these two measures may serve different uses as they are different ways of measuring overall patient health status. Anesthesia providers widely utilize the ASA-PS, but it does have some inherent problems associated with its use as a measure. Clear descriptions for each category within the classification system are lacking. There is noted variability between scores assigned by providers due to the measure's

subjective nature. For example, one provider may assign a score of two to a patient with well-controlled systemic diseases, while another provider may assign a score of three to the same patient because he or she has added together the cumulative effect of all illnesses (Fitz-Henry, 2011). Also, some providers may assign obese patients or patients at extremes of ages, such as neonates and those over 80 years of age as a three purely because of these factors (Fitz-Henry, 2011).

**Outcomes of Interest Relevant to the Phenomenon**

There are specific outcomes of interest that are possible but have not been used for this phenomenon of interest. These outcomes include FTR, which has been previously defined, hemorrhage as an adverse event, and escalation of care. Hemorrhage, also commonly referred to as "bleeding" in the literature can be broadly described as the departure of blood from blood vessels that have sustained an injury (Pickrell, 2003). It is further defined as the withdrawal of blood from the intravascular space (O'Toole, 2009). Although hemorrhage is frequently used to describe severe bleeding, the term refers to blood loss of any quantity occurring rapidly (Mosby, 2013). Within the context of surgery, hemorrhage can be defined in the perioperative period as a large amount of blood lost from the time of surgical incision until the point of patient discharge, or alternatively, any amount of blood lost rapidly from the intravascular space during as a result of surgery.

Escalation of care has been defined as modifying clinical behavior as a response to a patient's changing clinical state (Gawronski et al., 2018). This concept has also been described as recognizing a patient's clinical deterioration and communicating this deterioration to the most experienced or senior clinical colleague (Johnston et al., 2015). In the literature, escalation of care has been used to describe the augmented medical care and treatments or the transfer of a

patient to a higher-acuity area of a hospital. This concept has been primarily examined within the context of patient transfer from the emergency room or patient floor room to the intensive care unit (Bapoje, Gaudiani, Narayanan, & Albert, 2011; Cioffi, Salter, Wilkes, Vonu-Boriceanu, & Scott, 2006; V. Liu, Kipnis, Rizk, & Escobar, 2012). A few studies have examined escalation of care in the perioperative period (Ghaferi & Dimick, 2015; Robb & Seddon, 2010; Sydor et al., 2012; Symons, Almoudaris, Nagpal, Vincent, & Moorthy, 2013). These studies have focused on communication breakdowns, checklists, and handover protocols. Johnston and colleagues (2014) noted that the actual process of escalation of care had not been studied and concluded that inability to recognize a decline in patient health status and communication barriers were the most common reasons for failing to escalate care (Johnston, Arora, King, Stroman, & Darzi, 2014).

**Variables Affecting FTR.** Some variables have been found to have an effect on FTR during the perioperative period in the hospital setting. Several institutional characteristics have been cited to influence FTR. One component which has been found to impact overall surgical mortality is the volume of surgical cases performed (Friedman, Ananth, Huang, D'Alton, & Wright, 2016; Gonzalez, Dimick, Birkmeyer, & Ghaferi, 2014; Hernandez-Boussard et al., 2015). Other influential organizational aspects are the availability of necessary resources (Moriarty et al., 2014; Wakeam et al., 2014) and the use of medical technology (Ghaferi & Dimick, 2015; Sheetz, Dimick, & Ghaferi, 2016) which have been cited to decrease the incidence of FTR. Nursing characteristics such as staffing, educational background, clinical experience, and level of autonomy have also been noted to affect FTR (L. Aiken et al., 2011; Chau et al., 2015; Neff et al., 2013; Rao, Kumar, & McHugh, 2017; Van den Heede et al., 2009; Yasunaga et al., 2012).

Other influential organizational characteristics affecting FTR are patient safety culture (Brooke et al., 2012; Friese et al., 2015; Ghaferi & Dimick, 2016) and access to higher levels of care (Wakeam et al., 2014). Certain hospital characteristics have also been cited to influence patient outcomes such as FTR. Finally, both surgical resident involvement (Gopaldas, Overbey, Dao, & Markley, 2013; Sheetz et al., 2016) and status as a teaching institution (Navathe et al., 2013; Sheetz et al., 2016; J. Silber et al., 2009) have been shown to impact FTR.

Patient characteristics have also been shown to affect FTR rates. Advanced patient age has been linked to increased risk of being subject to FTR (Sheetz et al., 2014). The precise age for this increased risk, however, remains unclear with a study reporting this risk starting at 65 years of age (Gleeson et al., 2017) while other studies cite greater than 75 years old (Sheetz et al., 2014) or 80 years old or greater (Khan et al., 2018; Tamirisa et al., 2016) as risk factors. Race and ethnicity have also been cited to play a role in FTR, with studies citing those patients with non-white ethnicity are at a higher risk (Chan, Pinto, & Bratton, 2012; DiBardino et al., 2012; Sheetz et al., 2016).

Frailty has been cited to increase the risk of FTR (Joseph et al., 2016; Shah et al., 2018). Frailty has been described as a concept made up of decreased physical performance, speed of gait, mobility, mental health, nutritional status, and cognition (Rodríguez-Mañas et al., 2012). ASA-PS classification and comorbidities unrelated to surgery also impact FTR. Khan and colleagues (2018) noted that patients with an ASA-PS score of three or higher were more likely to be subject to an instance of FTR. Certain baseline comorbidities, unrelated to the reason for surgery such as COPD, CHF, renal failure (Khan et al., 2018) and history of MI (Wied et al., 2018) have been noted as patient-level factors associated with FTR. Pre-existing sepsis and pneumonia diagnoses have also been linked to FTR (Wied et al., 2018). Finally, the type of

surgical procedure done, and the surgical approach used may influence FTR (Farjah et al., 2015; Holena et al., 2016; Sheetz et al., 2013; Waits et al., 2014; Wright et al., 2013).

**Variables Affecting Escalation of Care.** Some variables have been found to affect escalation of care resulting from surgery in the hospital setting. Identification of patient deterioration has been cited as a critical aspect to escalation of care (Johnston et al., 2014). Several factors have been mentioned which influence a provider's recognition of declining patient condition. Clinical experience and provider education (Cox, James, & Hunt, 2006; Massey, Chaboyer, & Anderson, 2017) have been noted to affect the escalation of care process. Specifically, prior experience with patient deterioration events (Gazarian, Henneman, & Chandler, 2010), ability to recognize the patient's condition is not as expected (Minick & Harvey, 2003), and level of clinical skills (Endacott & Westley, 2006) have been mentioned in the literature. Nursing staffing characteristics, such as staffing ratios and high workload have also been noted to influence the identification of patient deterioration (Donohue & Endacott, 2010; Gawronski et al., 2018; Johnston et al., 2015; Peebles, Subbe, Hughes, & Gemmell, 2012).

Prompt communication of patient deterioration to a senior colleague is another carriable affecting escalation of care (Johnston et al., 2014). Once a patient's health decline is noted, it is essential to communicate these findings quickly to initiate escalation of care with the team. Resisting and hesitating to relay patient deterioration have been cited as issues leading to failure to escalate care (Massey et al., 2017). Some barriers have been noted to influence how quickly this information is shared with a senior colleague. Overconfidence (Pattison & Eastham, 2012) and delay in reaching the right staff (Cioffi et al., 2006; Peebles et al., 2012; Shearer et al., 2012) have been cited as reasons providers fail to report findings quickly. Hierarchical barriers and uncertainty of whom should be notified have also been found to influence communication of

deterioration (Cioffi et al., 2006; Endacott, Kidd, Chaboyer, & Edington, 2007; Peebles et al., 2012).

When a nurse can identify patient deterioration and effectively communicate it to a senior colleague, another issue which may prohibit a successful failure to escalate process is the senior colleague's speed in time to respond with action. High workload has also been found to influence how quick a senior colleague is able to respond to a crisis (Gawronski et al., 2018). For instance, the literature has cited that inadequate balancing of nursing seniority on a given shift may influence how many senior colleagues are available to assist when the need for escalation of care arises (Gawronski et al., 2018). Other variables which can affect the process of escalation of care at any level is the organizational demands and production pressures placed on providers which may compete with quickly caring for these patients (Gawronski et al., 2018).

**Variables Affecting Perioperative Hemorrhage**. There are some variables found to affect perioperative bleeding regardless of the surgical setting. These include pre-existing coagulopathies, acquired coagulopathies, the use of anticoagulants or blood thinning drugs, and surgical trauma. Patients with pre-existing coagulopathies such as sickle cells, antithrombin III deficiency, thrombocytopenia, factor XII deficiency, hemophilia, and protein S deficiency who undergo surgical interventions are at increased risk for bleeding complications (DeBois et al., 2005). Coagulopathies resulting from liver disease also place patients at increased risk of perioperative bleeding (Rai, Nagral, & Nagral, 2012). Coagulopathies can also be acquired as a result of blood loss and hemodilution from intravenous fluids and consumption of coagulation factors from the administration of large amounts of banked blood (Ghadimi, Levy, & Welsby, 2016).

Certain medications can also increase the risk of bleeding during surgery which can lead to hemorrhage. Oral anticoagulants, antiplatelet drugs, and vitamin K antagonists are examples of these drugs (Ghadimi et al., 2016; Grottke, Fries, & Nascimento, 2015). Finally, the type of surgery and the level of associated trauma associated with the procedure can also influence the likelihood of bleeding. Cardiopulmonary bypass, obstetric, organ, vascular, and emergency surgery all present a higher risk of bleeding in addition to surgical trauma such as vessel rupture and failure of the surgeon to adequately ligate the surgical wound (Grottke et al., 2015).

**Model-Specific Concepts**

The variables pertaining to nursing working conditions including temporal conditions and workload requirements have not been examined in the literature relating to ambulatory surgery. There is also a paucity of research regarding labor inputs, such as labor quantity and remuneration in ASC settings. Detailed information pertaining to anesthesia delivery structure and nursing functions in free-standing ASCs is also lacking. Thus, research conducted in settings outside of ASCs examining these concepts and related variables seen in the Minnick and Roberts Outcomes Production Model is identified for establishing conceptual definitions appropriate for this dissertation study.

**Working Conditions.** In a literature review assessing the relationships between nurse working conditions and patient outcomes Bae (2011) found several descriptors used for nursing conditions in the available research. The review included 11 studies examining the impact of nursing working conditions and outcomes such as, skin breakdown, medication errors, patient falls, infection, pain, pneumonia, mortality, hospital length of stay, and identification of new onset of patient symptoms (Bae, 2011). The following aspects of working conditions were noted: autonomy, nursing foundations for quality of care, nurse participation in hospital affairs, nurse

manager ability and support, collegial nurse-physician relationship, coworker cohesion, decentralization, patient-centered climate, staffing and resource adequacy, and busyness (Bae, 2011).

Stone and colleagues (2007) examined working condition variables including organizational climate, staffing, overtime, and wages, and hospital profits and magnet accreditation across 31 adult intensive care units (ICUs) on patient outcomes. Outcomes of interest in this study were central line associated bloodstream infections (CLABSI), catheter-associated urinary tract infections, ventilator-associated pneumonia, 30-day mortality, and decubitus ulcers. The research showed that nurse working conditions were positively associated with all of the outcomes measured. Of note, Stone et. al (2007) found that when ICU nurses worked less overtime hours, patients experienced less CLASBI (adjusted OR 0.33; 95% CI, 0.15-0.72). Stone and colleagues (2007) also noted that when ICU nurses worked more overtime hours, patients had increased odds of developing catheter- associated urinary tract infections ($p <$ 0.001) and higher rates of decubiti (adjusted OR 1.91; 95% CI= 1.17-3.11). Nurses' wages were also examined in this study but were not associated with any changes in outcomes (P. Stone, Mooney-Kane, Larsen, & Horan, 2007).

Another study performed by Seki and Yamazaki (2006) examined potential for stress and fatigue related to shift, sleep duration, workload, and busyness on nurse's perceived near-miss medical errors. The study found that during the day shift, near-miss errors were reported at a higher frequency when nursing services were delayed longer due to busyness (OR 7.99, 95% CI= 1.490–42.883) (Seki & Yamazaki, 2006). The investigators also found that although the number of patients assigned to nurses during the day shift was less than in the evenings, day shift nurses were frequently assigned to assist with other functions during their shift. These functions leading

to busyness and delayed regular nursing services included assisting physicians with preparation for surgery, examinations, injections, and other treatments in addition to regular nursing duties.

**Labor quantity.** Nursing staffing characteristics, such as staffing ratios and high workload have also been noted to influence the identification of patient deterioration (Donohue & Endacott, 2010; Gawronski et al., 2018; Johnston et al., 2015; Peebles et al., 2012). Several studies have cited that structural processes such as nurse staffing indicators of FTR (L. H. Aiken et al., 2002; Driscoll et al., 2018; Jack Needleman et al., 2002; J. H. Silber, Williams, Krakauer, & Schwartz, 1992). Needleman and colleagues (2002) examined the effects of nursing staffing levels in nearly 800 hospitals on the following patient outcomes: length of stay, urinary tract infection, pressure ulcers, hospital-acquired pneumonia, and shock or cardiac arrest.

In addition to these outcomes upper gastrointestinal bleeding, sepsis, deep vein thrombosis, wound infection, central nervous system complications, pulmonary failure, metabolic disturbances, FTR, and death were also investigated (J. Needleman et al., 2002). Total nursing hours had the greatest effect on the development of urinary tract infections (OR 0.48, CI= 0.38-0.61, $p<0.001$, $r = 0.1983$). The impact of nurse hours and the incidence of major events such as shock were also high (OR 0.48, CI= 0.27-0.81, $p= 0.007$, $r = 0.1983$). Reason (2000) also identified staffing issues and associated production pressures as latent conditions that affect the occurrence of adverse events in healthcare. Researchers reported a 7% increase in the chance of patient death within 30 days of hospital admission for each patient beyond the fourth assigned to nurses (L. H. Aiken et al., 2002).

**Patient characteristics.** The concept of patient characteristics is defined as a patient's baseline status before treatment or his or her status before a problem requiring treatment arises (Cathy A Maxwell, 2012). Patient characteristics, a variable used in many descriptive and

interventional studies, represents a variable that typically cannot be changed through experimentation. Patient characteristics may be clinical or demographic (Kane & Radosevich, 2011). Examples of demographic characteristics are a patient's age, race and ethnicity, gender, country of origin, and primary language (Iezzoni, 2013). Clinical factors may include physiological stability, extent, and severity of disease and sensory functioning (Kane & Radosevich, 2011). Socioeconomic and environmental factors may also be considered as patient baseline characteristics (Iezzoni, 2013). Socioeconomic status, employment and occupation, level of education, and geographic location are examples of such elements (Iezzoni, 2013). Patient characteristics are important because whenever a researcher conducts a study, he or she must consider patient characteristics thought to be most relevant for each outcome (Minnick, Roberts, Young, Kleinpell, & Marcantonio, 1997).

There are specific concepts of the general phenomenon and conceptual models that are of relevance to this dissertation. Patient characteristics thought to be most relevant for each outcome must be considered in every study (Minnick, Roberts, Young, Kleinpell, & Marcantonio, 1997). There is a multitude of patient characteristics that one may consider, however, several patient characteristics are of particular relevance to the phenomenon of interest. Chronological age can be described as the amount of time that an individual has been alive. Aging is related to overall physiological functioning changes and chronic comorbidities (Iezzoni, 2013). Age is essential to the general phenomenon because patients who are elderly have the highest rates of morbidity and mortality following surgery (Jin & Chung, 2001). Age has good face validity and is a risk factor for a variety of outcomes (Iezzoni, 2013). Age is typically measured as a continuous variable, although it may be grouped into categories (Huck, 2012). Sex can be described as an individual's biological and hormonal makeup. Biological sex impacts the

likelihood of acquiring some diseases and may predispose males and females to certain causes of death (Iezzoni, 2013). Sex also maintains face validity as a risk factor for specific outcomes and is measured categorically (Huck, 2012; Iezzoni, 2013).

Race and ethnicity are other patient characteristics that may affect the presence of specific comorbidities and causes of death (Iezzoni, 2013). Race can be described as a group of people who share the same genetic pool and can also be used as proxy for presumed biological differences (Iezzoni, 2013; Kane & Radosevich, 2011). Ethnicity represents a set of cultural factors that identifies one to a particular group of people (Kane & Radosevich, 2011). One challenge with collecting data on race and ethnicity is that it may be challenging to capture these variables in a consistent manner because operationalization of these concepts may vary significantly between studies (Iezzoni, 2013). The presence of comorbidities can be measured by using a continuous scoring system, such as with the Charlson Comorbidity measure or the Elixhauser Comorbidity Score, ordinal measurement as with ASA-PS, or categorical variables based on whether or not a disease is present. A final important patient characteristic with relevance to the phenomenon of interest is physical functional status measured by using a continuous METS score or DASI score.

**Organizational facets.** The facets of an organization are certain aspects or characteristics belonging to an organization. Organizational facets have been described as the overall structure of the organization, working environment, and organizational features (Cathy A Maxwell, 2012). Examples of an organization's operating environment are policies, protocols, and procedures, as well as, variations in clinical practice and training, unit culture, and level of teamwork (Boehm, 2016; Moore, 2017). Characteristics may include features within an organization that affect the degree of autonomy (Moore, 2017). Organizational facets have also been described concerning

the capability of healthcare professionals to use their knowledge and skills in the delivery of care (A. Minnick et al., 2007). The concept of organizational facets is extremely relevant to the phenomenon of interest. Facets such as accreditation status, nursing work environment and guidelines influencing work environment, access to higher levels of care, and the level of oversight through accreditation are particularly important to this dissertation.

## 2.4 Definition of Terms

Definitions of the key terms: working conditions, temporal conditions, workload requirements, labor quantity, and remuneration were established through the use of existing definitions and applications found in dissertation and independent research studies (L. H. Aiken et al., 2002; Bae, 2011; Gigli-Hittle, 2017; Cathy A Maxwell, 2012; A. Minnick et al., 2007; Moore, 2017; J. Needleman et al., 2002; Seki & Yamazaki, 2006; P. Stone et al., 2007; Widmar, 2012). The definition for anesthesia delivery structure is derived, in part, from the American Association of Nurse Anesthetists' (AANA's) description of anesthesia team models. Finally, the definition for state regulation was derived from legal and policy textbooks (Farnsworth Baker, 2016; Longest, 2016) and a literature review conducted by the PhD candidate regarding ASC regulatory oversight (Table A1).

**Working conditions.** Working conditions are defined as the working environment and existing circumstances affecting labor in the workplace. This includes aspects such as working time, flexibility of work hours, staff-to-patient ratio, workload, number of nursing staff, job requirements, level of autonomy, and remuneration.

***Temporal conditions.*** ASC hours of operation, personnel shift structure and length, hours worked, flexibility of working hours.

***Workload requirements.*** Number of patients, patient assignments, types and number of surgeries (Alghamdi, 2016).

***Labor quantity.*** Total number of full-time equivalents (FTEs), part-time equivalents (PTEs), and per diem providers, as well as types of providers.

***Anesthesia delivery structure.*** Type of model used for anesthesia services and who employs anesthesia personnel.

***Remuneration.*** Average annual salary, manner employees are compensated, annual overtime hours paid.

**Functions.** Responsibilities and work duties carried out by nurse anesthetists, perioperative nurses, circulating nurses, scrub nurses, and Licensed practical nurses/Licensed vocational nurses (LPNs/LVNs).

**State regulations.** State regulations represent rules established at the individual state-level to control activities and processes for ambulatory surgery centers.

# Chapter Three

## 3.1 Research Design and Assumptions

The study was designed using a descriptive, cross sectional approach to describe organizational facets, employment terms, and characteristics of labor in the ASC setting. The descriptive, cross-sectional design has been frequently and successfully used in a multitude of studies which have sought to describe healthcare and other organizations. The cross-sectional design was also ideal for this study because it allowed for the examination of many variables. As described by the Minnick and Roberts Outcome Production Model (A. Minnick, 2001) several variables that may possibly influence patient outcomes, such as capital inputs, organizational facets, employment terms, and labor quantity and quality, employee attitudes, employee behavior, patient characteristics, and patient experience. The aims of this dissertation study focused on on specific variables addressed in the model, namely, organizational facets, employment terms, and labor characteristics.

## 3.2 Description of Research Setting

The setting was a national survey mailed to ASCs located in the five states found highest in regulation and the five states found to have the lowest level of regulation (sample design described below). This survey was distributed by mail to ASC administrators.

## 3.3 Sample and Sampling Plan

### Nature and Size of Sample

The principle investigator (PI) considered several alternatives when determining the sample frame for this dissertation study. Existing records included those available free of purchase and those that were available for purchased at variable costs. All of these sampling frames appeared to be representative of the national population of ASCs because all lists included a large number of ASCs in all 50 states and the District of Columbia. The Healthcare Cost and Utilization Project (HCUP) State Ambulatory Database (SAD) and ASC Quality Reporting Program (ASCQR) was considered for obtaining contact information for ASCs. The HCUP-SAD included only HOPDs for some states and the ASCQR database contained data on 5,121 HOPDs and free-standing pay-for-reporting ASCs. The ASCQR exhibited the additional advantage of availability without purchase to the PI. One clear limitation to the HCUP-SAD database was its focus on HOPDs rather than free-standing ASCs which was not reflective of the overall aims of the study.

The candidate also contacted four medical list companies which claimed to offer national ASC contact lists at varying set fees. Complete Medical Lists, Integrated Medical Data, and Medico Reach offered ASC lists containing 5,916, 5,943, and 5,105 total ASCs, respectively. Definitive Healthcare was the fourth data list company contacted by the candidate. A representative of this company informed the PI that lists were not sold to students or individuals because they were reserved for medical businesses. All of these medical lists included both HOPD and free-standing HOPDs. The PI noted that many of the available ASC lists possessed several weaknesses such as inherent cost and variable number and types of ASCs listed in each database.

During the dissertation proposal process, the candidate became aware of the first annual Leapfrog ASC survey on patient safety that began on April 1, 2019. Due to the paucity of national ASC studies, the PI elected to reach individuals playing a key role in the new survey to

discuss this dissertation study and possible sampling frames from which to draw the study sample. Emails were sent and phone calls were made to the Director of Health Care Ratings at Leapfrog in charge of measurement and public reporting activities, including the new ASC survey. The PI also contacted the Chief Clinical Officer of the American Association of Nurse Anesthetists and member of the Leapfrog ASC survey expert panel. The candidate consulted these experts to discuss the sampling plan used in the Leapfrog study.

These individuals provided invaluable information including the advantages of using ASCs certified by Medicare and accessible via the publicly-available Centers for Medicare and Medicaid Services (CMS) online ASC database. A major advantage to this sampling frame was that the list represented a complete record of all CMS-certified ASCs across the United States. Other available lists varied in number of recorded ASCs and no distinction was made on whether facilities were free-standing or HOPDs. It remains challenging to know the exact number of free-standing ASCs, nationally, because states vary in regulation regarding licensure, accreditation, and certification. The Director of Health Care Ratings also expressed a potential challenge to identifying ASCs types on other lists because hospitals may often own ASCs as joint ventures, making those facilities difficult to categorize as either HOPDs or free-standing. Ultimately, the PI elected to use the Medicare ASC database because it would decrease the likelihood of coverage error; the clear advantage was that this list was comprehensive, containing every CMS-certified ASC across all states.

**Criteria for Sample Selection, Criteria for Inclusion and Exclusion**

The Medicare ASC database includes 5,636 ASCs in all 50 states and the District of Columbia. Due to time and financial considerations for mailings involved in conducting the study and a previous study of state regulations conducted by the candidate in 2018, 10 states

were used for this dissertation research. In keeping with the aims of this study, and based on these factors, the five most regulated and five least regulated states comprised the sample selected for the study. Based on the PI's independent literature review examining ASC regulatory oversight by state, the five states with the most regulation were: Connecticut, Delaware, Nevada, New York, and Virginia. Each of these states require a certificate of need for the establishment of an ASC and individual centers must both obtain state licensure and maintain third-party accreditation.

The following five states represent the least regulated states based on the same review of the literature: Idaho, Wisconsin, Iowa, Vermont, and Pennsylvania. Idaho and Wisconsin do not require certificate of need status, state licensure, or third-party accreditation for ASC operation. Iowa and Vermont do not require state licensure or accreditation. These two states differ only in that Iowa requires certificate of need for all ASCs and Vermont requires certificate of need in certain instances, specifically for specialized centers or physician offices dedicated to outpatient surgery. The state of Pennsylvania does not require a certificate of need status and does not require that ACSs obtain state licensure for "Class A" facilities, which include private or group practice offices where only local or topical anesthesia is used. Additionally, Pennsylvania statues only state that "Class A" facilities require accreditation.

Therefore, the sample selected consisted of Medicare-certified ASCs operating in the following states: Connecticut, Delaware, Nevada, New York, Virginia, Idaho, Wisconsin, Iowa, Vermont, and Pennsylvania. The sample represents states from Southern, Western, Midwestern, and Northeastern regions. The total potential sample size based on the number of certified ASCs in these states was 714.

Inclusion criteria for the study population was registered, CMS-certified ASCs geographically located in the United States which provide anesthesia services. Exclusion criteria for this dissertation study included hospitals, settings providing emergency medical care, and surgical settings in which post-operative patient hospitalization is expected or healthcare services exceed 24 hours following initial admission (Centers for Medicare & Medicaid Services, 2016).

**Methods for Subject Recruitment**

The candidate used the CMS ASC database to obtain contact information for survey mailings. Of note, the Medicare database list of ASCs did not contain administrative or leadership contact information, therefore, the principal investigator (PI) addressed all correspondence to "ASC Administrator." The PI checked the accuracy of each ASC's mailing address by accessing the online list and verifying that each ASC address corresponded with publicly available postal addresses of existing facilities online. This verification process occurred during multiple occasions. These time-points included the proposal phase, one week before the first survey mailing, several days before the second mailing, and upon receipt of returned mailing envelopes and postcards sent from Vanderbilt several days prior to the third survey mailing. Addresses for all returned postcards and envelopes were checked using online facility information and websites.

In cases in which the ASC no longer appeared to be open for business the PI noted temporary and permanent closures as indicted by online facility searches. The PI also called ASCs by telephone that either appeared to be open via online search but produced "return to sender" results when mailed to the only available addresses, and ASCs that indicated "temporarily closed" and "permanently closed" via online searches and individual facility websites. During these phone calls, the PI noted which ASCs were no longer operating and the

facilities that had moved locations or changed names. Based on prior conversation with the Leapfrog group representative, the use of incentives was not believed to aid in recruitment of participants to this study because many of these facilities are not permitted to accept incentives. Therefore, no incentives were used for this dissertation study.

**Response rate and non-response error.** Most administrative studies have found that response rates are higher with paper surveys and that the logistics of paper surveys will be manageable (Dillman, Smyth, & Christian, 2014; Manfreda, Bosnjak, Berzelak, Haas, & Vehovar, 2008; Shih & Fan, 2008). Mail surveys have been noted to achieve response rates of 50% or higher (Dillman et al., 2014). There are presently no published national studies describing nursing working conditions or safety in ASCs. As such, an attempt was made by the candidate to obtain available information regarding administrator response rates for all existing ASC studies, regardless of the area of focus for these studies (data are described below).

The National Survey of Ambulatory Surgery (2006) which sought to examine national estimates of surgical and nonsurgical procedures performed in both free-standing and hospital-affiliated ASCs was reviewed. A 74.4% response rate was noted among free-standing ASC administrators with 295 of 472 ASC administrators responding to the mailed survey (Cullen, Hall, & Golosinskiy, 2018). The Ambulatory Surgery Center Survey on Patient Safety Culture Pilot Study (2015) target population is another study which included ASC administrators as some target participants. The survey for this study was not sent exclusively to ASC administrators, but rather, was also sent to medical professionals employed at these ASC facilities. Of those participating ASCs, 25% were hospital-affiliated ASCs and 75% were free-standing ASCs representing 20 states. Average ASC response rate for the Ambulatory Surgery

Center Survey on Patient Safety Culture study was 77% and the average number of completed surveys per ASC was 31 surveys (Agency for Healthcare Research and Quality, 2015a).

The candidate also reviewed a Meta-analysis estimating survey response rates among organizational top-management executives which indicated an overall 32% response rate among administrators (Cycyota & Harrison, 2006). The PI also examined prior Vanderbilt University School of Nursing dissertations for overall response rates when nursing leadership or administration was represented in the target study sample. One dissertation which surveyed nursing leadership, such as nurse managers, in U.S. institutions with a Pediatric Intensive Care Unit department yielded a response rate of 39% (Gigli-Hittle, 2017). Another dissertation which included surveying senior-level administrators reached a response rate of nearly 30% (C.A. Maxwell, 2012). The PI's conjecture for the estimated response rate for the proposed dissertation study is approximately 32-62%.

Finally, the candidate attempted to obtain general response rate information on the ongoing Leapfrog ASC study. The Leapfrog group was unable to share expected and actual response rates for this survey to date, as the PI was advised that this information would be only provided as a national report of aggregate data once there has been firm submission of survey responses. Potential Leapfrog participants are asked to obtain a security code which is issued once ASC administrators have provided a copy of a form of business license or accreditation of group through Centers for Disease Control Surveillance data. This extra step will not be used in this dissertation study to facilitate ease of participation and the fact that the study is not seeking outcomes, legal, or financial data. The PI did join the Leapfrog newsletter, as suggested by Mrs. Stewart, to view preliminary data and information regarding response rates which was publicly reported in early 2020.

All survey research may be subject to overall non-response error. This is an important consideration with this dissertation study. The PI will use several strategies to improve non-response. A unit nonresponse occurs when a sampled unit, for example, an ASC administrator does not respond to any part of the survey (Biemer, 2010). In other cases, item nonresponse occurs when a question item has been left blank or skipped (Biemer, 2010). Items may be accidentally or intentionally left incomplete by respondents (Salant, Dillman, & Don, 1994). Intentionally skipping of questions may occur because of the respondent's perceived sensitive nature of the question.

***Unit non-response.*** The most essential step to minimizing unit non-response is to assure that the survey is sent to the appropriate individual. The PI will make telephone contact with ASCs, as discussed earlier in this chapter, to confirm that contact information for the appropriate target participants, individual ASC hospital administrators, is accurate. To minimizing the potential for nonresponse, the candidate will assure participant confidentiality and protection of data (Dillman et al., 2014; National Academy of Sciences, 2009). Specific methods used by the PI to safeguard participant identity and study data are discussed later in this chapter as they pertain to human subjects' protection. Providing ways for sample participants to assess the authenticity of a survey request and allowing opportunity for participants to ask questions about the survey has also been noted to decrease non-response error (Dillman et al., 2014). Personal contact information will be included within the survey invitation and instructions so that participants may reach the PI with any questions or concerns.

Dillman et al. (2014) also suggest that utilizing sponsorship by a legitimate organization is an important aspect of survey research so that participants not only to assess the veracity of the study, but also to gain participant trust by endorsement of a legitimate sponsor. The candidate

indicated Vanderbilt University School of Nursing as sponsoring organization within the mailed introductory study letter. The introductory letter detailed the value of the contribution made by participants in this study and clearly indicated the benefits of conducting the dissertation work. The PI also utilized regular and postage-paid envelopes marked with the official Vanderbilt University School of nursing logo. These envelopes served to provide a professional appearance to all study material, remind participants that the study originates from a legitimate organization, and decreases subject cost-burden for personal envelope and stamp purchase, making it easier to respond. Finally, employing follow-up reminder procedures for non-responders is an important strategy (Dillman et al., 2014), thus, the candidate mailed out follow-up letters at a time specified later in this chapter discussing data collection methods.

***Item non-response.*** Strategies to decrease item non-response error are to ensure the survey questions are user-friendly, easy to read, and interesting. Using a variety of question styles contributes to a more appealing survey (Dillman et al., 2014). Surveys that are long and too detailed are often too complicated to answer and result in lower response rates and missed items due to cost burden of time (Dillman et al., 2014). The survey used questions that are relevant to the target sample, interesting, succinct as possible, and variable in format. Details regarding survey development and testing are presented in the "Instrument" section below. Additionally, reducing requests for sensitive information in the survey (Dillman et al., 2014) is important for avoiding item non-response. The PI minimized any requests for sensitive information in the survey items.

**Strategies to Ensure Human Subjects Protection**

The dissertation proposal and all mailing documents associated with this study were reviewed by the PI's dissertation committee. No patient names or identifying information were

collected in the survey. Surveys were only sent to ASC administrators; the target participants for this dissertation, in individual envelopes addressed to "ASC Administrator". Vanderbilt IRB approval was obtained for this study which was considered "exempt". Within the cover letter sent with each survey mailing the PI provided informed subjects of the nature of the dissertation study and of their role in the study (National Academy of Sciences, 2009). Participants were also informed that participation was voluntary, the benefits of the study, and how to contact the PI with any questions or concerns.

With consideration that there may be a risk of participant identification with any study, several steps were taken by the PI to ensure participant confidentiality. Regarding this dissertation study, the predominant risk was that ASC administrators may somehow be identified by their geographic location or surgery center name. To address this concern surveys were numerically coded so that submitted surveys and corresponding facilities could be identified only by the examinee. In an effort to maintain confidentiality, the candidate manually submitted responses received from the paper survey distribution into the Vanderbilt Research Electronic Capture (REDCap) database. REDCap is a secure web-based program that can be used to build and manage surveys and databases (Patridge & Bardyn, 2018). REDCap is Health Insurance Portability and Accountability Act (HIPAA) compliant and extremely secure as it uses encryption (Patridge & Bardyn, 2018). Any electronic surveys taken by administrators were developed and stored on the REDCap platform.

All potentially identifying participant information was stored in REDCap using a list of ASC numbers that was not directly linked to patient identity. REDCap also allowed the study administrator to assign specific rights to other individuals to access study data (Patridge & Bardyn, 2018). The candidate, committee chair, and statistician, Dr. Mary Dietrich, were the

only individuals granted access by the PI to the dissertation study via REDCap. Every copy of the completed paper survey was stored in a locked file cabinet within a locked room and no identifiers were used in the statistical analysis process or reported in the study's findings. The PI ensured that downloaded files used for statistical analysis did not contain any identifiers and only aggregate data was reported for this study. All participant identifiers, paper copies of the survey, and electronic survey files will be destroyed by the candidate within one year after the close of the study.

## 3.4 Data Collection Methods

### Procedures

A survey was developed by the candidate for this dissertation using the Outcomes Production Model as a guide. This survey is discussed in further detail in the "Instrument" section of this chapter. ASCs were identified using the Medicare ASC database. Current contact information to include administrator addresses for potential subjects was confirmed via PI phone calls to each ASC. Subjects were recruited using a pre-distributed upcoming survey announcement via mail. This mailing was sent directly to ASC administrators and included information regarding the aims of the study and when paper surveys were expected to arrive. An initial paper survey was sent to administrators at these facilities, as well as, information on the survey cover letter should the site administrators have decided to complete the surveys using an electronic format. A second and third survey mailing were sent at a time specified later in this section. Facilities received postage-paid return envelopes with each of the distributed surveys. Once completed surveys were received, the PI entered individual survey responses into the REDCap encrypted database.

**Study Timeline**

1. **Post Card.** The PI sent a post card correspondence to ASC administrators on April 10, 2020 to inform the potential participants of an upcoming survey mailing (Appendix C).
2. **First Survey Distribution.** Two weeks following post card mailing, the candidate mailed the paper surveys for the first time. The mailing was sent on April 24, 2020 and included an introductory letter describing the nature of the dissertation study and candidate contact information (Appendix C). Additionally, the letter stated the value of the contribution made by participants in this study and clearly indicated the benefits of conducting the dissertation work. This mailing included a protected survey link as an option for completing the survey in lieu of the paper survey format. These items were sent in envelopes with Vanderbilt School of Nursing logos. Pre-paid postage return envelopes were used that contained the Vanderbilt School of Nursing address pre-filled by the PI as the return mailing address.
3. **Second Survey Distribution.** It was determined after the first survey mailing that mail correspondence via the United States Postal Services (USPS) was moving at a slower rate than usual due to the COVID-19 pandemic. In response to this, the second survey mailing was delayed by three business days to allow respondents sufficient time to respond after the first survey mailing. On May 13, 2020, approximately two-and-a-half weeks following the first survey mailing, a second survey mailing was performed by the candidate. The mailing included a reminder letter describing the nature of the dissertation study and PI and Committee Chair contact information, value of the contribution made by participants, and the benefits of conducting the study (Appendix C). This mailing included a protected survey link as an option for completing the survey in lieu of the

paper survey format. These items were sent in envelopes with Vanderbilt School of Nursing logos and pre-paid postage return envelopes with the Vanderbilt School of Nursing address pre-filled by the PI as the return mailing address.

4. **Third Survey Distribution.** On May 30, 2020 the PI mailed out the final survey request. This ensured the exact time interval between the second and third survey mailings as was used between the first and second survey mailings to address USPS mailing delays as a result of the ongoing pandemic. The mailing included a final reminder letter describing the nature of the dissertation study and candidate contact information, value of the contribution made by participants, and the benefits of conducting the study (Appendix C). This mailing included a protected survey link as an option for completing the survey in lieu of the paper survey format. These items were sent in envelopes with Vanderbilt School of Nursing logos and pre-paid postage return envelopes with the Vanderbilt School of Nursing address pre-filled by the PI as the return mailing addressed.

**Instruments**

There are no existing instruments used to examine organizational facets, employment terms, and characteristics of labor in the ASC setting. The candidate developed a survey specific to the aims of this dissertation using the Outcomes Production Model as a foundation (Figure B1). The survey was designed to obtain the greatest description of organizational facets, patient characteristics, and perioperative outcomes and was tested through the use of a card sort by content experts before study distribution to ensure tool validity. The PI noted any deficiencies with conceptual definitions and modified questions as needed to ensure clarity and concordance between the items and the dissertation study aims. A pilot test was then performed by distributing the survey to seven ASC administrators and any weaknesses addressed during the

pilot study were addressed and corrected by the candidate. Individual ASC administrator suggestions made during pilot testing were considered by the PI and adjustments were made to the proposed survey as necessary. The details of the card sorting process and pilot testing are discussed in the section to follow.

**Validity and Reliability**

**Card sort.** Four potential participants were contacted separately and asked to participate in the dissertation card sort using via an introductory email sent by the candidate. The following individuals were invited to take part in this card sort: Dr. Cathy Maxwell, Dr. Julia Phillippi, Dr. Lori Shirle, and Dr. Shayne Hauglum. All of the participants solicited are nursing researchers. Dr. Cathy Maxwell and Dr. Lori Shirle, specifically, represent health services research. Dr. Lori Shirle and Dr. Shayne Hauglum both possess a CRNA background. All of the individuals contacted agreed to willingly take part in the dissertation card sort.

The card sort was administered and analyzed using Vanderbilt REDCap. The candidate manually entered each of the 29 items into the REDCap system and provided the same eight concepts as foils for each question. The following foils were used: temporal conditions, workload requirements, labor quantity, anesthesia delivery structure, remuneration, functions, state regulation, and institutional policy. The concepts used for the card sort were defined according to health services research publications and nursing practice.

Participants were sent instructions to select one concept that is measured by each of the 29 items. The experts were informed as to the purpose of the card sorting process to test the validity of each item and agreement among participants. The individuals were thanked for their willingness to participate and were asked to submit their card sort responses within two weeks following date of the survey email. The survey email, including a copy of the instructions for the

card sort and list of conceptual definitions, was then sent via email to each expert with an embedded hyperlink to the electronic REDCap survey. Once results from all participants were received through REDCap, the candidate uploaded the card sort responses onto the IBM Statistical Package for the Social Sciences (SPSS), Version 26.

***Card Sort One.*** The responses obtained from the card sort and any feedback provided by the experts was noted. The results of card sort were taken into account, and the candidate developed a second card sort to address items five items that had achieved less than 75% agreement during the card sort one (Table A3). Card sort two was then sent to the four original card sort participants.

***Card Sort Two.*** All four participants involved in the first card sort also took part in card sort two. The responses gathered from the second card sort were recorded (Table A4). No additional comments or feedback was sent during card sort two. The results of the second card sort indicated that four of the five items presented achieved an acceptable agreement of 75% (Table A4). The following item achieved a 50% agreement rate: "Who is RESPONSIBLE FOR evaluating surgical patients for discharge?" Careful consideration will be taken when testing this item in the pilot phase of the dissertation and ASC administrator feedback will be noted.

**Pilot Test.** The dissertation survey was pilot tested with seven ASC administrators. The recruitment process began with three ASC administrators known to the PI through the Medicare ASC database. A snowball recruitment technique was used to locate the four additional ASC administrators also identified on the ASC database. The primary purpose of the pilot test was to determine potential weaknesses in the overall dissertation survey design. The fitness of survey items and question arrangement was also examined by the PI through this phase of study. Respondents were instructed to circle any items, or wording used within items or foils, which

may have been confusing or required further clarification. Examples of participant feedback included modifying the wording of one item and adjusting the language used in another item to make the question clearer to the reader. An additional aim of the pilot test was to determine the average length of time necessary for potential subjects to complete the dissertation survey. The candidate asked that each ASC administrator record the length of time in minutes, that it took him or her to complete the survey. The average total time reported by participants for completion was 15 minutes.

Following the completion of the survey, each ASC administrator underwent a debriefing interview. During this interview, the candidate reviewed every survey item with each administrator. ASC administrators were asked to describe, using their own words, the meaning of each survey item. When participants expressed any concerns regarding question construction, the PI asked the following question: "How could I have worded this question to make it clearer for you as a participant?" Feedback for one such item mentioned during the interview was recorded. The PI also asked the following two additional questions to address the potential for dissertation non-response error: "What would increase interest among your administrator colleagues to participate in this survey; and what do you think are barriers in deciding not to participate in this survey?" Responses to these questions were also be documented. One participant suggested that the PI underscore the advantages to ASC administrators participating in this survey. The PI used this feedback to underscore the benefits for study participation in the cover letter that was later sent to potential participants with each survey mailing.

## 3.5 Data Analysis

Data analyses were performed using the IBM Statistical Package for the Social Sciences (SPSS) for the three specific aims pertaining to this study. Data was thoroughly examined to assess for the presence of missing responses before statistical analyses were performed. All missing data were coded as "missing". Any patterns of missing data for survey items observed by the PI were noted and described.

**Specific Aim 1:** Describe nursing working conditions in ambulatory surgery centers in the United States.

There is a paucity of studies examining the working environment and existing circumstances affecting nursing labor in the ASC setting. Specific aim 1 represents a descriptive aim developed to fill this gap in the literature. The candidate has separated the concept of nursing working conditions into the following sub concepts: temporal conditions, workload requirements, labor quantity, anesthesia delivery structure, and remuneration. A total of 22 survey questions were constructed for this dissertation survey to describe nursing work conditions. A detailed list of specific survey items addressing each sub concept pertaining to nursing working conditions can be found in Table A5. Normally distributed continuous data were summarized by using means and standard deviations, medians and interquartile ranges were utilized for ordinal data and skewed distributions, and frequency distributions were reported for nominal data.

**Specific Aim 2:** Describe the functions of licensed nursing personnel in ambulatory surgery centers.

There are no identified studies examining the functions of licensed nursing personnel in the ASC setting. Specific aim 2 represents a descriptive aim that was constructed to address this gap in the literature. A total of four survey questions were developed for this dissertation survey

to describe nursing work conditions. A detailed list of specific survey items which address nursing functions, defined as responsibilities and work duties carried out by nurses, is located in Table A5. Normally distributed continuous data were summarized by using means and standard deviations, medians and interquartile ranges were utilized for ordinal data and skewed distributions, and frequency distributions were reported for nominal data.

**Specific Aim 3:** Determine the relationships of state regulations and ambulatory surgery center nursing working conditions.

There is no known information pertaining to state regulations and nursing working conditions in the ASC setting. Specific aim 3 represents a descriptive aim created by the candidate to fill this research gap. The PI included the following two concepts for Aim 3: state regulations and institutional policy. A total of 3 survey questions were constructed for this dissertation survey to describe state regulations and institutional policy. A detailed list of specific survey items addressing each sub concept pertaining to these two concepts be found in Table 1. Normally distributed continuous data were summarized by using means and standard deviations, medians and interquartile ranges were utilized for ordinal data and skewed distributions, and frequency distributions was reported for nominal data. Additionally, the PI conducted a recent literature review on the level of regulatory oversight in the freestanding-ASC setting. The results of this literature review are shown in Table A1.

The candidate PI also checked for nonresponse bias during data analysis. The risk of variability in survey responses related to preference of participant incentives does not exist with this dissertation study, as no incentives were used (Dillman et al., 2014). The PI performed an evaluation to determine whether survey responders and non-respondents differed in key variables of interest (Dillman et al., 2014). Nonresponse bias was assessed when the PI conducted a

statistical comparison of the responder and non-responder groups based on specific variables. Variables of interest included ASC size, determined by surgical volume, ASC surgical specialty, determined by types of procedures performed at each facility and ASC geographic location. A t-test was used for continuous variables, chi-square statistical testing will be performed for dichotomous variables and non-parametric tests was performed when less than five subjects are noted in one variable category.

# Chapter Four

## 4.1 Sample Characteristics

The 2020 Medicare ASC database list was used for the study sample as described in detail in Chapter Three. Of the 742 surveys mailed to ASCs meeting the study inclusion criteria, it was determined that 26 ASCs were either permanently or temporarily closed due to the COVID-19 pandemic during the duration of the study mailing timeline. After correction for undeliverable mail and facility closures, the final study response rate was 20.7% (n=144).

An appraisal of sample representativeness was based on region and regulatory status. Summaries of the characteristics of respondent and non-respondent ASCs are shown in Table 1. There were no statistically significant differences ($p > 0.05$) noted with regard to AHA region indicating that responders were representative of the regions to which the surveys were sent. ASCs were also analyzed based on state regulation status which refers to the number of state-level mandates for oversight including certificate of need, state licensure, and third-party accreditation. Although there was no statistically significant difference by AHA region, Least-regulated states (ID, WI, IA, VE, and PA) were somewhat more likely to respond ($p = 0.007$) than most-regulated states (CT, NY, DE, VA, and NV).

*Table 1. Comparison of Respondent and Non-respondents by American Hospital Association Region and State Regulation States*

| | **Total ASCs[1] n= 702** | **Respondent ASCs n=141** | **Non-Respondent ASCs n= 561** | **p-value** |
|---|---|---|---|---|
| | n (%) | n (%) | n (%) | |
| **AHA Region** | 702 (100) | 141 (100) | 561 (100) | 0.070 |
| Region 1: CT, VT | 44 (6.3) | 4 (2.8) | 40 (7.1) | |

| | | | | |
|---|---|---|---|---|
| Region 2: NY, PA | 367 (52.3) | 76 (53.9) | 291 (51.9) | |
| Region 3: DE, VA | 75 (10.7) | 15 (10.6) | 60 (10.7) | |
| Region 5: WI | 78 (11.1) | 19 (13.5) | 59 (10.5) | |
| Region 6: IA | 24 (3.4) | 4 (2.8) | 20 (3.6) | |
| Region 8: ID | 51 (7.3) | 16 (11.3) | 35 (6.2) | |
| Region 9: NV | 63 (9.0) | 7 (5.0) | 56 (10.0) | |
| **State Regulation Status*** | | | | 0.007 |
| Most-regulated | 315 (44.9) | 49 (34.0) | 266(47.7) | |
| Least-regulated | 387 (55.1) | 92 (63.9) | 295(52.8) | |

[1]ASCs= Ambulatory Surgery Centers
*State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency. Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV). Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).

Of the 144 ASC respondents, 120 answered a survey question asking about American Society of Anesthesiologists' (ASA) status. The median number of ASA 1 patients in these facilities was 769.5 (IQR 259.5, 2000.0). The median number of ASA 2 patients served was 1501.5 (IQR 800.0, 25000.0). A median number of 610.0 (IQR 127.0, 1968.8) ASA 3 patients were provided care. No ASCs reported providing services to ASA 4 patients. The mean total postoperative length of stay (LOS) was 42.75 (SD 26) minutes. Variations of LOS statistics are further discussed on page 87.

ASCs were also asked whether they performed the following specialty surgeries: bariatric, pediatric, spinal, laparoscopic, or robotic surgeries. One center was reported to perform robotic surgery (0.7%) and 2.1% of ASCs (3 of 144) performed bariatric surgery. A quarter of facilities (36 of 144, 25%) were reported to perform laparoscopic surgery and 13.9% spinal

procedures (20 of 144). Pediatric procedures were the most cited specialty surgeries provided: 55 of 144 ASCs (38%). Of the 64 ASCs reporting specialty surgeries, 27 (18.8%) performed one type of specialty surgery, 24 (16.7%) offered two types, 12 (8.3%) provided 3 types, and one (0.7%) did four types of specialty surgeries.

Statistical analyses were performed on the basis of types of services offered. Service type and service type varieties are important variables for ASC study because variety affects other aspects of service provision such as length of procedure, resultant postoperative recovery time, and staff necessary for procedure performance. Types of services rendered at ASCs were examined and the "Service Type" variables comprised of "Ortho", "GI", "Eye", and "Unclassifiable" were created. Each service type contained at least ten ASCs to enable statistical tests for differences. "Ortho", an important variable due to the growing number of orthopedic surgeries in this setting, represents ASCs providing only orthopedic services or one or two orthopedic-related services (e.g. hand surgery). "GI" includes ASCs performing only gastrointestinal (GI) or one or two other related procedures. "Eye" represents ASCs performing only eye procedures and one or two other related eye procedures (e.g. eye plastic surgery). The variable "≥4" includes ASCs performing four or more procedure types that are unrelated. The final "Unclassifiable" variable represents ASCs reporting individual specialties that did not sum to at least ten ASCs. It includes services such as ear, nose, and throat and pain procedures, and urologic, gynecologic dental, and vascular, neurologic, and cardiac surgery. Most of the Unclassifiable service offered one or two services (93.3%).

*Postoperative LOS* was then assessed by service type. LOS was shortest for eye procedures at 21.1 (SD 14) minutes. GI procedures were the next shortest at 40 minutes (SD 21.2). Patients undergoing orthopedic procedures were reported to have an average LOS of 49.4

minutes (SD 18.4). Unclassifiable service types averaged 45.9 (SD 31.8) minutes. The greater than/equal to four service type reported the longest LOS at an average of 54.1 (SD24) minutes.

*Procedure Volume* was also examined by service types (Table 2). Based on distributions noted in frequency analysis, procedure volume was classified into "Low-volume" i.e. performing <3,540 average procedures, "Mid-volume" i.e. completing between 3,540 to 5,597 procedures, and "High-volume" i.e. carrying out >5,597 procedures annually. Low-volume ASCs accounted for the highest number of facilities (45%), while mid-volume and high volume accounted for 29.3 and 25.7%, respectively. Differences in procedure volume by service type were observed to be statistically significant ($p \leq 0.05$). Post hoc analysis using Bonferonni- correction ($p < 0.05$) indicated the Unclassifiable service type in low-volume ASCs ($p < 0.001$) accounted for this statistically significant difference.

*Table 2. Procedure Volume by Service Type*

| | | **Service Type[1]** | | | | |
|---|---|---|---|---|---|---|
| | **All (n=140)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=27)** | **≥4 (n=47)** | **Unclassifiable[2] (n=29)** |
| **Procedure Volume*** | | | | | | |
| Low-volume[3] | 63 (45.0) | 3 (30.0)$_a$ | 7 (25.9)$_a$ | 11 (37.9)$_a$ | 18 (37.5)$_a$ | 24 (82.8)$_b$ |
| Mid-volume[4] | 41 (29.3) | 3 (30.0) | 9 (33.3) | 12 (31.4) | 15 (31.3) | 2 (6.9) |
| High-volume[5] | 36 (25.7) | 4 (40.0) | 11 (40.7) | 4 (13.8) | 14 (29.2) | 3 (10.3) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]Low-volume centers perform <3,540 average procedures annually.
[4]Mid-volume centers perform between 3,540 to 5,597 procedures annually.

[5]High-volume centers perform >5,597 procedures annually.

[*]Indicates a statistically significant finding of p≤0.05

*ASC accreditations and hospital descriptors* (Table 3.) Almost two-thirds (64.6%) of participating ASCs reported having CMS-certification, state licensure, and third-party accreditation. Additionally, 25% of all ASCs cited maintaining a combination of two of these forms of regulatory oversight; most of these reporting CMS-certification and third- party accreditation for oversight. Less than one percent (0.7%) stated having solely one type of regulatory oversight. Most ASCs (72.9%) were accredited by the Accreditation Association for Ambulatory Health Care (AAAHC). Accreditation performed by Joint Commission accounted for 17.4% of ASCs, and 3.5% were accredited by American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF). No ASCs reported accreditations from Healthcare Facilities Accreditation Program (HFAP) or the Institute for Medical Quality (IQM). With respect to hospital affiliation, the majority of ASCs (95.1%) reported affiliation with either a teaching hospital or a non-teaching hospital; 4.2% of ASCs reported affiliation with both teaching and non-teaching hospitals. When considering third-party accreditation bodies, types and number for regulatory oversight, and number of hospital affiliations there was no statistically significant difference by service type ( $p > 0.05$).

*Table 3. Accreditations and Hospital Affiliations* (N=144)

| | n (%) |
|---|---|
| **Accreditation** | |
| AAAASF[3] | 5 (3.5) |
| AAAHC[4] | 105 (72.9) |

| | |
|---|---|
| HFAP[5] | 0 (0.0) |
| IQM[6] | 0 (0.0) |
| Joint Commission | 25 (17.4) |
| **Regulatory[7]** | |
| None | 0 (0.0) |
| 1 | 1 (0.7) |
| 2 | 36 (25.0) |
| 3 | 93 (64.6) |
| **Hospital Affiliation** | |
| None | 1 (0.7) |
| 1 Affiliation | 137 (95.1) |
| 2 Affiliations | 6 (4.2) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]American Association for Accreditation of Ambulatory Surgery Facilities
[4]Accreditation Association for Ambulatory Health Care
[5]Healthcare Facilities Accreditation Program
[6]Institute for Medical Quality
[7]Total Regulatory indicates the total number of any combination of the following types of regulatory oversight at each center: None, CMS-certification, state licensure, third-party accreditation (e.g. 3 indicates that the center is CMS-certified, licensed by the state, and third-party accredited).
[8]Hospital Affiliation indicates the total number of any combination of the following types of hospital affiliations at each center: No hospital affiliation, teaching hospital affiliated, and non-teaching hospital affiliated (e.g. 2 affiliations indicated the center is affiliated with both teaching hospitals and non-teaching hospitals).

Note: Total N varies by accreditation and affiliation; some respondents did not complete all listed items.

### 4.2 Analysis by Study Aim

**Specific Aim 1:** To describe nursing work conditions in ambulatory surgery centers in the United States.

Survey items relating to nursing work conditions included those concerning labor quantity, anesthesia delivery structure, workload requirements, renumeration, and temporal conditions. Questions related to temporal conditions included days of the week ASC provides services, hours worked weekly, personnel shift length on weekdays and weekends, flexibility of shift-scheduling, and number of patients assigned to providers. Additional items for this aim were type of anesthesia model and remuneration for licensed nursing personnel.

*Labor quantity: Types of personnel*. Some ASCs did not employ all types of workers. All ASCs employed perioperative RNs, 127 employed circulating RNs, and 51 staffed scrub RNs. The majority (n = 131) employed OR technicians. Forty-three were reported to have LPN/LVNs as workers. With regard to anesthesia providers, 62.5% of ASCs stated they used CRNAs to provide anesthesia services and 54.2% used MDAs. A total of 41 (28.5%) ASCs responded that anesthesia services were rendered by both CRNAs and MDAs.

Nearly half (49.3%) of ASCs reported employing one to five full time Perioperative RNs, about half (53%) also employed one to four part time Perioperative RNs, and 61% employed one to four of these workers as per-diem staff. Almost three quarters (71%) of centers reported employing one to four full time Circulating RNs. Almost two fifths (39%) reported employing one to two of these workers on a part time basis, and 49% employed them as per-diem staff. Of the 45 ASCs who reported employing Scrub RNs, 40% employed at least some as per-diem staff, 31% employed at least some of these workers as part time employees, and 66% reported at least

some full time Scrub RNs on staff. Of the 48 centers that reported employing CRNAs, 60% stated they employed per-diem CRNAs, about one-third (36.4%) employed these workers part time, and over half (52.2%) employed full time CRNAs. Of those 43 ASCs that reported employing LPN/LVNs, seven (15.9%) employed at least some per-diem, 25% reported part time employment, and approximately a two-thirds employed one to three full time LPN/LVNs (67.5%). Of the 126 ASCs who employed OR Technicians, 37.3% stated they employed at least some per-diem OR Technicians, approximately a two-thirds (66.4%) had employed at least some of these workers part time. The majority (89%) reported employing at least one full time. There was no statistically significant difference in worker staffing by service type ($p > 0.05$).

*Anesthesia model.* The most frequently reported model was MDA-only (22.9%) model in which Medical Doctors of Anesthesia (MDAs) provide direct anesthesia care followed by the CRNA-only (20.1%) model with Certified Registered Nurse Anesthetists (CRNAs) performing anesthesia care autonomously (Table 4). The Mixed-model through (MDAs and CRNAs both provide anesthesia care) accounted for the next highest reported number (19.4%) with the remainder of the anesthesia model including medical direction and medical supervision (25%). Other anesthesia models with no provider type names included: conscious sedation (n= 9), local anesthesia only (n= 6), and oral anxiolysis (n= 2). Anesthesia Assistants under the MDA supervision was reported by one ASC. There was a statistically significant difference in the Mixed-model by service type ($p < 0.001$) and post hoc analysis indicated that the ≥4 service type was more likely to use this model than other service types. There was also a statistically significant difference in the Other anesthesia model category ($p = 0.004$) with the difference between the ≥4 and Unclassifiable service types accounting for this finding. The ≥4 service type was more likely to use conscious sedation.

*Table 4. Ambulatory Surgery Center Anesthesia Model by Service Type*

| | **Service Type[1]** | | | | | |
|---|---|---|---|---|---|---|
| | **All (n=144)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=29)** | **≥4 (n=48)** | **Unclassifiable[2] (n=30)** |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| **Anesthesia Model** | | | | | | |
| MDA-only[3] | 33 (22.9) | 1 (10.0) | 6 (22.2) | 9 (31.0) | 13 (27.1) | 4 (13.3) |
| CRNA-only[4] | 29 (20.1) | 1 (10.0) | 6 (22.2) | 9 (31.0) | 7 (14.6) | 6 (20.0) |
| Medical-direction[5] | 19 (13.2) | 2 (20.0) | 6 (22.2) | 0 (0.0) | 8 (16.7) | 3 (10.0) |
| Medical-supervision[6] | 17 (11.8) | 0 (0.0) | 5 (18.5) | 3 (10.3) | 4 (8.3) | 5 (16.7) |
| *Mixed-model[7] | 28 (19.4) | 5 (50.0)$_a$ | 2 (7.4)$_a$ | 5 (17.2)$_a$ | 15 (31.3)$_b$ | 1 (3.3)$_a$ |
| *Other | 18 (12.5) | 1 (10.0)$_{a, b}$ | 2 (7.4)$_{a, b}$ | 3 (10.3)$_{a, b}$ | 1 (2.1)$_b$ | 11 (36.7)$_a$ |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]MDA-only= All anesthesia provided by Medical Doctor of Anesthesia
[4]CRNA-only= All anesthesia provided by Certified Nurse Anesthetist
[5]Medical-direction= Occurs when an anesthesiologist is involved in up to four concurrent procedures undergoing anesthesia provided by qualified nonphysician anesthetists
[6]Medical-supervision= Occurs when a physician oversees more than four concurrent procedures undergoing anesthesia provided by qualified nonphysician anesthetists
[7]Mixed-model= MDA and CRNA provide direct anesthesia care

*Indicates a statistically significant finding of $p \leq 0.05$.

*Number of patients: Concurrent* (Table 5). ASCs reported a median of 2.0 patients were assigned to RNs at the same time (IQR 1.0, 2.0) and a median of 1.0 patients was assigned to all

other worker types. There was no statistically significant difference in the number of patients concurrently assigned to personnel based on service type ($p > 0.05$).

*Table 5. Median Number of Patients Assigned Concurrently by Worker*

| | **Worker** | | | | | |
|---|---|---|---|---|---|---|
| **# Patients** | **Perioperative RN[1] (n=143)** | **Circulating RN (n=125)** | **Scrub RN (n=50)** | **CRNA[2] (n=94)** | **LPN/LVN[3] (n=43)** | **OR Technician[4] (n=128)** |
| Median | 2.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| IQR | 1.0, 2.0 | 1.0, 1.0 | 1.0, 1.0 | 1.0, 1.0 | 1.0, 2.0 | 1.0, 1.0 |

[1]RN= Registered Nurse
[2]CRNA= Certified Registered Nurse Anesthetist
[3]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse
[4]OR Technician= Operating Room Technician

*Number of patients: Per shift.* As shown in Table 6, the overall number of patients assigned per shift was quite similar for all worker types. Median values were between 7.7 and 9.0 with IQRs generally between 5 and 14. However, with the exception of LPN/LPNs, statistically significant differences in the number of patients assigned per shift were observed among service types within each of the types of workers (All $p < .05$). As can be seen in Table 6, generally the GI and Eye service types had higher numbers of patients assigned per shift than did the other service types. Bonferroni-corrected pairwise post-hoc tests using $p < .005$ revealed that the GI service types had significantly more perioperative RNs, circulating RNs, and CRNAs than did the Ortho, ≥4 or Unclassifiable service types. These service types also had more OR Technicians than did the ≥4 or Unclassifiable service types and more Scrub RNs than did those with ≥4 service types. The group of Eye service types also had significantly more Circulating RNs and CRNAs than did the Ortho, ≥4 or Unclassifiable service types, and more Perioperative RNs and OR Technicians than did those with ≥4 service types (all $p < .005$, see Table 6).

*Table 6. Median Number of Patients Assigned Per Shift by Worker and Service Types*

| | | **# Patients by Service Type[1]** | | | | |
|---|---|---|---|---|---|---|
| | **All** | **Ortho** | **GI** | **Eye** | **≥4** | **Unclassifiable[2]** |
| ***Worker Type*** | | | | | | |
| ***Periop RN[3]** | | | | | | |
| n | 142 | 8 | 27 | 29 | 48 | 30 |
| Median | 9.0 | 7.0 | 13.5 | 10.0 | 8.0 | 7.5 |
| IQR | 6.0, 12.5 | 4.25, 8.0 | 10.0, 16.0 | 8.0, 15.0 | 6.0,10.0 | 4.0, 10.3 |
| ***Circulating RN** | | | | | | |
| n | 124 | 8 | 17 | 29 | 47 | 23 |
| Median | 8.0 | 5.0 | 14.0 | 12.0 | 6.0 | 5.0 |
| IQR | 5.0, 12.4 | 4.0, 6.8 | 11.0, 17.0 | 8.0, 15.0 | 5.0, 8.0 | 4.0, 9.0 |
| ***Scrub RN** | | | | | | |
| n | 50 | 3 | 6 | 9 | 20 | 12 |
| Median | 7.75 | 7.0 | 15.5 | 8.0 | 6.75 | 5.5 |
| IQR | 5.0, 12.0 | 5.0, 9.0 | 10.5, 18.5 | 7.8, 13.5 | 5.0, 8.8 | 4.3, 10.8 |
| ***CRNA[4]** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| n | 91 | 7 | 19 | 17 | 34 | 14 |
| Median | 8.0 | 5.0 | 12.0 | 12.0 | 6.5 | 6.5 |
| IQR | 5.0, 12.0 | 4.0, 6.0 | 10.0, 14.0 | 10.0, 15.0 | 5.0, 8.8 | 4.8, 9.3 |
| **LPN/LVN[5]** | | | | | | |
| n | 42 | 1 | 13 | 9 | 12 | 23 |
| Median | 9.0 | 20.0 | 12.0 | 7.0 | 8.0 | 5.0 |
| IQR | 5.0, 14.3 | 20.0, 20.0 | 9.0, 15.0 | 5.0, 18.5 | 5.4,11.4 | 5.0, 12.0 |
| ***OR Technician[6]** | | | | | | |
| n | 126 | 9 | 23 | 27 | 46 | 21 |
| Median | 8.0 | 5.0, | 12.0 | 12.0 | 6.0 | 6.0 |
| IQR | 5.0, 12.6 | 4.0, 10.5 | 10.0, 15.0 | 9.0, 15.0 | 5.0, 8.3 | 4.0, 9.5 |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
3Periop RN= Perioperative Registered Nurse
[4]CRNA= Certified Registered Nurse Anesthetist
[5]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse
[6]OR Technician= Operating Room Technician

*Indicates a statistically significant finding of $p \leq 0.05$

*Remuneration* (Table 7), Scrub RNs were reported to have the highest salary with a median of $70,000 annual income (IQR 53040, 80000). Circulating RNs and Perioperative RNs were reported to have similar median salaries of $69,057 and $67000, respectively. LPNs/LVNs were reported as having the lowest annual salary with a median of $47, 507 (IQR 41800, 54000). Overall, ASCs reported paying a median of 40 hours of overtime pay (IQR 40.0, 200.0) per staff member over the last year.

CRNA remuneration models included: fixed annual salary, fee-for service (the CRNA bills for each anesthetic), hourly pay with no minimum number of hours of pay guaranteed, and hourly pay with a minimum number of guaranteed hours of pay. Fee-for-service (27.2%) and fixed-salary (24%) accounted for approximately one-third of pay schedules. Hourly pay with (9.8%) and without (15%) a minimum number of hours of guaranteed pay were the least reported anesthesia remuneration models. Twenty-two ASCs (24%) reported that they were unsure of the remuneration model because CRNAs were employed by an outside group who handled payments for anesthesia services rendered. Analyses by service types was contraindicated because service type and location were related and pay is strongly associated with geographic location. The number of responses to this survey item preclude this analysis.

*Table 7. Licensed Nursing Personnel Annual Salary*

| | **Median Salary** |
|---|---|
| ***Provider Type*** | |
| **Perioperative RN[1]** | |
| n | 123 |
| Median | 67000 |
| IQR | 60000, 70000 |
| **Circulating RN** | |

| | |
|---|---|
| n | 106 |
| Median | 69057 |
| IQR | 60000, 76375 |
| **Scrub RN** | |
| n | 37 |
| Median | 70000 |
| IQR | 53040, 80000 |
| **LPN/LVN[2]** | |
| n | 33 |
| Median | 47507 |
| IQR | 41800, 54000 |

[1]RN= Registered Nurse
[2]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse

*Temporal conditions: Days of service.* The majority of ASCs reported they provided services on Mondays (95.8%), Tuesdays (95.1%), Wednesdays (96.5%), Thursdays (88.2%), and Fridays (88.2%). A statistically significant difference ($p < 0.001$) was seen in those centers providing Friday services based on service types. Post hoc analysis using Bonferroni-correction ($p < 0.05$) indicated that eye services accounted for this difference with this service type less likely to provide service on Fridays than other service types. Some ASCs reported weekend services with 8.3% stating they provide services Saturdays and 2.1% citing services on Sundays. Less than one percent (0.7%) of ASCs offered services on both Saturdays and Sunday.

*Work hours.* Overall, the mean number of hours worked by Registered Nurses (RNs) was reported as 35.8 hours per week (SD 6.1). CRNAs were reported to work a mean of 34 hours per week (SD 8.3). ASCs also reported that Licensed Practical Nurses/Licensed Vocational Nurses (LPNs/LVNs) worked an average of 36.7 (SD 6.0) and Operating Room (OR) Technicians

worked a mean of 36 hours per week (SD 7.2). There was no statistical difference in hours worked per week by type of worker based on service type ($p > 0.05$) with the exception of OR Technicians ($p = 0.02$). Mann-Whitney analysis revealed OR technicians worked fewer hours in the Eye service type than GI ($p = 0.003$) and Unclassifiable ($p = 0.030$) service types. OR technicians also worked less weekly hours in GI than the ≥4 ( $p = 0.043$) service type.

Summaries for shift length on weekdays for personnel are shown in Table 8. ASCs reported similar means and SD across personnel types with RNS accounting for a slightly higher average shift length of 8.3 hours per day (SD 1.1). There was no statistically significant difference in weekday shift length based on service type ($p > 0.05$). Of the 14 institutions that reported providing weekend services there was no statistically significant difference by provider type working on weekend on shifts based on service type ($p > 0.05$) with a mean of about eight hours and SD ranging from 0.9 to 1.2 hours.

*Table 8. Shift Length in Hours for Personnel on Weekdays by Service Type*

| | **Shift Length in Hours Service Type[1]** | | | | | |
|---|---|---|---|---|---|---|
| | **All** | **Ortho** | **GI** | **Eye** | **≥4** | **Unclassifiable[2]** |
| **Personnel Type** | | | | | | |
| **RN[3]** | | | | | | |
| n | 144 | 10 | 27 | 29 | 48 | 30 |
| Mean (SD)[4] | 8.3 (1.0) | 7.9 (1.1) | 8.3 (0.7) | 8.6 (1.0) | 8.4 (1.0) | 8.0 (1.3) |
| **CRNA[5]** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| n | 89 | 7 | 19 | 17 | 32 | 14 |
| Mean (SD) | 7.9 (1.2) | 7.5 (0.8) | 7.4 (1.1) | 7.8 (1.1) | 8.2 (1.4) | 8.0 (1.4) |
| **LPN/LVN[6]** | | | | | | |
| n | 41 | 1 | 13 | 9 | 11 | 7 |
| Mean (SD) | 8.0 (0.8) | 8.0 (0.0) | 8.2 (0.4) | 8.3 (0.9) | 7.8 (0.6) | 7.7 (1.5) |
| **OR Technician[7]** | | | | | | |
| n | 130 | 10 | 24 | 27 | 47 | 22 |
| Mean (SD) | 8.2 (1.0) | 7.9 (1.1) | 8.2 (0.7) | 8.4 (1.1) | 8.2 (1.0) | 8.2 (1.4) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]RN= Registered Nurse
[4]Mean (SD) in hours by service type
[5]CRNA= Certified Registered Nurse Anesthetist
[6]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse
[7]OR Technician= Operating Room Technician

*Scheduling process and schedule type* (Table 9). The majority of ASCs reported using an assigned fixed schedule of pre-determined shifts selected by another individual (44.4%) and an assigned flexible schedule of varying hours designated by another individual (43.6%) as the most common scheduling processes. Provider self-scheduling scheduling using flexible hours (6.9%) was reported as the least commonly used method for scheduling. Statistically significant differences by service type were found in those centers reporting fixed assigned scheduling ($p = 0.011$), fixed self-scheduling ($p = 0.009$), and flexible assigned scheduling ($p = 0.014$). Post hoc

analysis revealed that the GI service type accounted for a greater use of fixed assigned scheduling than other service types (Bonferonni-corrected, $p \leq 0.05$). Post hoc analysis also showed that GI and Eye service types were responsible for the statistically significant difference (Bonferonni-corrected, $p \leq 0.05$) when fixed self-scheduling and flexible assigned scheduling (Bonferonni-corrected, $p \leq 0.05$) had been reported. When fixed assigned scheduling and flexible assigned scheduling where reported, the Clinical Manager was cited as the primary individual determining shift assignment, 32.8% and 32.8% respectively.

*Table 9. RN Shift Scheduling Process and Schedule Type by Service Type*

| | | **Service Type[1]** | | | | |
|---|---|---|---|---|---|---|
| | **All (n=144)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=29)** | **≥4 (n=48)** | **Unclassifiable[2] (n=30)** |
| **Shift Scheduling Process** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** |
| ***Assigned (Fixed)[3]** | 64 (44.4) | 5 (50.0)$_a$ | 20 (74.1)$_b$ | 9 (31.0)$_a$ | 18 (37.5)$_a$ | 12 (40.0)$_a$ |
| ***Self-scheduling (Fixed)[4]** | 18 (4.9) | 1 (10.0)$_a$ | 4 (14.8)$_b$ | 0 (0.0)$_b$ | 4 (8.3)$_a$ | 9 (30.0)$_b$ |
| ***Assigned (Flexible)[5]** | 63 (43.8) | 3 (30.0)$_a$ | 7 (25.9)$_b$ | 20 (31.0)$_b$ | 22 (45.8)$_a$ | 11 (36.7)$_a$ |
| **Self-scheduling (Flexible)[6]** | 10 (6.9) | 1 (10.0) | 0 (0.0) | 2 (6.9) | 6 (12.5) | 1 (3.3) |
| **Fixed Scheduler** | | | | | | |
| **Clinical Manager** | 20 (32.8) | 4 (80.0) | 4 (22.2) | 5 (62.5) | 6 (31.6) | 1 (9.1) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Charge RN** | 8 (13.1) | 1 (20.0) | 4 (22.2) | 0 (0.0) | 2 (10.5) | 1 (9.1) |
| **Administrator** | 17 (27.9) | 0 (0.0) | 5 (27.8) | 2 (25.0) | 3 (15.8) | 7 (63.6) |
| **DON/RN Manager** | 14 (23.0) | 0 (0.0) | 4 (22.2) | 1 (12.5) | 7 (36.8) | 2 (18.2) |
| **Assistant Manager** | 1 (1.6) | 0 (0.0) | 1 (5.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| **Scheduling Committee** | 1 (1.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (5.3) | 0 (0.0) |
| **Flexible Scheduler** | | | | | | |
| **Clinical Manager** | 19 (32.8) | 1 (33.3) | 2 (28.6) | 7 (41.2) | 6 (30.0) | 3 (27.3) |
| **Charge RN** | 9 (15.5) | 1 (33.3) | 1 (14.3) | 3 (17.6) | 3 (15.0) | 1 (9.1) |
| **Administrator** | 12 (20.7) | 0 (0.0) | 1 (14.3) | 5 (29.4) | 2 (10.0) | 4 (36.4) |
| **DON/RN Manager** | 17 (29.3) | 1 (33.3) | 3 (42.9) | 1 (5.9) | 9 (45.0) | 3 (27.3) |
| **Assistant Manager** | 1 (1.7) | 0 (0.0) | 0 (0.0) | 1 (3.4) | 0 (0.0) | 0 (0.0) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]Assigned (fixed) indicates a schedule of pre-determined shifts selected by another individual (e.g. 7am-3pm shifts assigned five days a week for the LPN by the Charge RN).
[4]Assigned (flexible) indicates a schedule of pre-determined shifts selected by another individual (e.g. Workdays assigned for the RN by the Charge RN with the selection of varying hours).
[5]Self-scheduling (fixed) indicates a schedule of pre-determined shifts personally chosen by the employee (e.g. OR Technician selects schedule from available predetermined shifts).
[6]Self-scheduling (flexible) indicates a schedule provided based on employee choice/availability (e.g. CRNA selects which days and times he or she is available to work).

*Indicates a statistically significant finding of $p \leq 0.05$

Note: Participants were able to select more than one answer for this item.

**Specific Aim 2:** To describe the functions of licensed nursing personnel in ambulatory surgery centers.

Questions were related to nursing functions inquired about specific worker duties, perioperative nursing care assignment, and provider responsible for performing preoperative anesthesia evaluations and discharging patients after surgery. The following material is based only those ASCs who employed the personnel type under discussion.

*Personnel duties* (Table 10). Of those respondents who described specific duties for each provider, most (114 of 144, 79.2%) reported that Perioperative RNs were responsible stocking drugs and the majority were charged with checking emergency equipment (133 of 144, 92.4%). The majority of ASCs (91 of 127, 71.7%) reported circulating RNs were responsible for stocking drugs (60.6%) and emergency equipment (64.6%). More than half of the respondents (54.9%) indicated Scrub RNs performed cleaning duties. Overall, Circulating RNs (71.7%), LPN/LVNs (65.1%), and OR Technicians (86.3%) were also reported to perform cleaning duties at a higher frequency than other duties.

Approximately a third (110 of 144, 76.4%) of Perioperative RNs were reported as responsible for patient transport. Respondents reported that less than a third of Circulating RNs (38 of 127, 30%) were responsible for follow-up calls to patients while nearly two thirds of ASCs reported they conducted patient transport (82 of 127, 64.6%) and patient assessment (78 of 127, 61.4%). Nearly a third of Scrub RNs were reportedly responsible for patient transport (15 of 51, 29.4%) while few conducted patient assessment (6 of 51, 11.8%) and calls to patients (7 of 51, 13.7%). Ninety respondents reported either directly employing or contracting CRNAs for anesthesia services. Of these centers, about half (47 of 90, 52.2%) reported that CRNAs carried out patient transport, 62.2% reported nurse anesthetists were responsible for patient assessment

(56 of 90), and few reported CRNAs (6 of 90, 6.7%) performed follow-up calls. Approximately a third of respondents reported that LPN/LVNs performed patient assessment (14 of 43, 32.6%), and equal numbers reported LPN/LVNs (18 of 43, 41.9%) were responsible for both patient transport and follow-up calls to patients. For over a third (47 of 131, 35.9%) of ASCs patient transport was reported as a duty carried out by OR Technicians. Few respondents reported that OR Technicians were responsible for calls to patients (8 of 131, 6.1%) and patient assessment (5 of 131, 3.8%). Overall, OR technicians were reported more often for duties such as stocking equipment (80.9%), inventory (67.9%) and cleaning (86.3%) than other worker types.

*Table 10. Provider Duties: Stocking Drugs and Equipment, Inventory, and Cleaning (N=144)*

| | **Duty** | | | | |
|---|---|---|---|---|---|
| | **Stocking Drugs** | **Stocking OR Equipment** | **Checking Emergency Equipment** | **Inventory** | **Cleaning** |
| ***Provider Type*** | n (%) | n (%) | n (%) | n (%) | n (%) |
| **Perioperative RN[1]** | 114 (79.2) | 91 (63.3) | 133 (92.4) | 87 (60.4) | 110 (76.4) |
| **Circulating RN** | 77 (60.6) | 82 (64.6) | 75 (59.1) | 71 (55.9) | 91 (71.7) |
| **Scrub RN** | 10 (19.6) | 22 (43.1) | 15 (29.4) | 19 (37.3) | 28 (54.9) |
| **CRNA[2]** | 21 (23.3) | 21 (23.3) | 19 (21.1) | 14 (15.6) | 23 (25.6) |
| **LPN/LVN[3]** | 11 (25.6) | 26 (60.5) | 10 (23.3) | 21 (48.8) | 28 (65.1) |
| **OR Technician[4]** | 19 (14.5) | 106 (80.9) | 20 (15.3) | 89 (67.9) | 113 (86.3) |

[1]RN= Registered Nurse
[2]CRNA= Certified Registered Nurse Anesthetist
[3]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse
[4]OR Technician= Operating Room Technician

Note: Data in table represents only those centers who reported employing above provider types

*Additional Duties* (Table 11). Of those respondents who described specific duties for each provider, most reported that Perioperative RNs were responsible for patient assessment (138 of 144, 95.8%) and follow-up calls to patients (127 of 144, 88.2%). Approximately a third (110 of 144, 76.4%) reported that Perioperative RNs were responsible for patient transport. Less than a third of Circulating RNs (38 of 127, 30%) were reported as responsible for follow-up calls to patients while nearly two thirds conducted patient transport (82 of 127, 64.6%) and patient assessment (78 of 127, 61.4%). Almost a third of Scrub RNs were reportedly responsible for patient transport (15 of 51, 29.4%) while few conducted patient assessment (6 of 51, 11.8%) and calls to patients (7 of 51, 13.7%). Respondents from 90 ASCs reported either directly employing or contracting CRNAs for anesthesia services. Of these respondents, about half reported that CRNAs carried out patient transport duties (47 of 90, 52.2%), 62.2% reported nurse anesthetists were responsible for patient assessment (56 of 90), and very few reported that CRNAs (6 of 90, 6.7%) performed follow-up calls. Approximately a third of respondents reported that LPN/LVNs performed patient assessment (14 of 43, 32.6%) and that equal numbers of LPN/LVNs (18 of 43, 41.9%) were responsible for patient transport and follow-up calls to patients. Over a third (47 of 131, 35.9%) of participants reported patient transport as a duty carried out by OR Technicians. Overall, few respondents reported that OR Technicians were responsible for calls to patients (8 of 131, 6.1%) and patient assessment (5 of 131, 3.8%).

*Table 11. Provider Duties Including Patient Transport, Patient Assessment, and Follow-up Phone Calls to Patients (N=144)*

| | **Duty** | | |
|---|---|---|---|
| | **Patient Transport** | **Patient Assessment** | **Follow-Up Calls** |
| ***Provider Type*** | n (%) | n (%) | n (%) |

| | | | |
|---|---|---|---|
| **Perioperative RN[1]** | 110 (76.4) | 138 (95.8) | 127 (88.2) |
| **Circulating RN** | 82 (64.6) | 78 (61.4) | 38 (29.9) |
| **Scrub RN** | 15 (29.4) | 6 (11.8) | 7 (13.7) |
| **CRNA[2]** | 47 (52.2) | 56 (62.2) | 6 (6.7) |
| **LPN/LVN[3]** | 18 (41.9) | 14 (32.6) | 18 (41.9) |
| **OR Technician[4]** | 47 (35.9) | 5 (3.8) | 8 (6.1) |

[1]RN= Registered Nurse
[2]CRNA= Certified Registered Nurse Anesthetist
[3]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse
[4]OR Technician= Operating Room Technician

Note: Data in table represents only those centers who reported employing above provider types

Note: Participants were able to select more than one response for each item.

*Duties by ASC Service Type* (Table 12). There were statistically significant differences noted for Circulating RNs for the drug stocking ($p < 0.001$), checking emergency equipment ($p = 0.038$), and cleaning ($p = 0.026$) duties. Post hoc analysis showed that the difference between the GI and Eye service types was responsible for the statistically significant difference noted for Circulating RNs for restocking drugs (Bonferonni corrected, $p \leq 0.05$). Specifically, Circulating RNs were least likely to stock drugs in the GI service type (29.4%) and most likely to perform this duty in the Eye service type (82.8%). Post hoc testing revealed that the GI service type also resulted in the significant finding for Circulating RNs with regards to checking emergency equipment (Bonferonni corrected, $p \leq 0.05$) with this worker type least likely to check emergency equipment in the GI service type (35.3%) when compared to other types of service.

The difference between Ortho and ≥4 service types was found to be responsible for the statistically significant finding (Bonferonni corrected, $p \leq 0.05$) noted in the CRNAs for cleaning duties after post hoc analysis. CRNAs were most likely (71.4%) to perform cleaning duties in the Ortho service type and least likely to be responsible for cleaning (12.1%) for the ≥4 service type.

*Table 12. Statistically Significant Differences in Provider Duties by Service Type*

| | | **Service Type**[1] | | | | |
|---|---|---|---|---|---|---|
| | **All (n=144)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=29)** | **≥4 (n=48)** | **Unclassifiable (n=30)** |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| **Stocking Drugs** | | | | | | |
| *Circulating RN[2] | 77 (60.6) | 7 (77.8)$_{a,b}$ | 5 (29.4)$_{a}$ | 24 (82.8)$_{b}$ | 31 (66.0)$_{a,b}$ | 10 (40.0)$_{a,b}$ |
| **Checking Emergency Equipment** | | | | | | |
| *Circulating RN | 75 (59.1) | 7 (77.8)$_{a}$ | 6 (35.3)$_{b}$ | 16 (55.2)$_{a}$ | 34 (72.3)$_{a}$ | 12 (48.0)$_{a}$ |
| **Cleaning** | | | | | | |
| *Circulating RN | 91 (71.7) | 9 (100.0)$_{a}$ | 10 (58.8)$_{a}$ | 23 (79.3)$_{a}$ | 36 (76.6)$_{a}$ | 13 (52.0)$_{a}$ |
| *Scrub RN | 28 (54.9) | 4 (100.0)$_{a}$ | 1 (16.7)$_{a}$ | 7 (77.8)$_{a}$ | 12 (60.0)$_{a}$ | 4 (33.3)$_{a}$ |
| *CRNA | 23 (25.6) | 5 (71.4)$_{a}$ | 6 (31.6)$_{a,b}$ | 4 (23.5)$_{a,b}$ | 4 (12.1)$_{b}$ | 4 (28.6)$_{a,b}$ |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes

centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]RN= Registered Nurse
[3]CRNA= Certified Registered Nurse Anesthetist
[4]LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse

[*]Indicates a statistically significant finding of $p \leq 0.05$

*Assignment of nursing care* (Table 13). The majority of respondents (91 of 143, 63.2%) reported that a different RN is responsible for performing preoperative, intraoperative, and postoperative duties for the same patient. This assignment pattern for a different RN carrying out perioperative and intraoperative duties was statistically significant ($p = 0.002$). Post hoc analysis revealed that the differences between the ≥4 and Unclassifiable service types accounted for this statistically significant finding (Bonferonni corrected, $p \leq 0.05$). Specifically, it was reported that ASCs were most likely to use this assignment pattern for the ≥4 service type (79.2%) and least likely to use this form of nursing care assignment for the Unclassifiable service type (33.3%). Respondents reported that 22.2% of the time (32 of 144) the same RN performs only preoperative and postoperative care for the same patient, a finding that was not statistically significant based on service type ($p > 0.05$). Few respondents (11 of 144, 7.6%) reported that the same RN performs preoperative, intraoperative, and postoperative care for the same patient which was statistically significant ($p = 0.006$).

Post hoc analysis (Bonferonni corrected, $p < 0.05$) showed that the Unclassifiable service type was most likely (23.3%) to use an assignment pattern in which the same RN performs all perioperative and intraoperative nursing care. Few respondents (5.6%) also reported that personnel other than an RN can care for patients (n= 8) and one respondent (0.7%) reported nursing assignment pattern as "Other" (e.g. one preoperative RN, a different postoperative RN, and no intraoperative nurse is assigned per patient). Neither of these two categories of patient assignment pattern were statistically significant ($p > 0.05$) among service types.

*Table 13. Perioperative Nursing Care Assignment by Service Type (N= 144)*

| | | Service Type[1] | | | | |
|---|---|---|---|---|---|---|
| | **All** | **Ortho** | **GI** | **Eye** | **≥4** | **Unclassifiable[2]** |
| **Assignment Pattern** | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| *Same RN[3] Performs Preop, Intraop, and Postop Care for Same Patient | 11 (7.6) | 0 (0.0)$_a$ | 2 (7.4)$_a$ | 0 (0.0)$_a$ | 2 (4.2)$_a$ | 7 (23.3)$_a$ |
| Same RN Performs Only Preop and postop Care for Same Patient | 32 (22.2) | 3 (30.0) | 6 (22.2) | 8 (27.6) | 5 (10.4) | 10 (33.3) |
| *A Different RN Performs Preop, Intraop, and Postop Care for Same Patient | 91 (63.2) | 7 (70.0)$_{a,b}$ | 16 (59.3)$_{a,b}$ | 20 (69.0)$_{a,b}$ | 38 (79.2)$_b$ | 10 (33.3)$_a$ |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]RN= Registered Nurse

*Indicates a statistically significant finding of p≤0.05

*Responsible provider: Preoperative anesthesia evaluation* (Table 14). More than half of respondents (54.9%) reported that a Medical Doctor (MD) was responsible for performing anesthesia preoperative evaluations and over one third (36.8%) responded that a Medical Doctor of Anesthesia (MDA) was expected to complete the evaluation. An additional 44.4% of participants reported that CRNAs were responsible for performing preoperative evaluations, while few (6 of 144, 3.5%) reported that someone other than these provider types conducted preoperative evaluations. "Other" personnel reported as responsible for performing preoperative evaluations included: Perioperative RN (n = 2), Preoperative RN (n = 2), and Doctor of Osteopathic Medicine (DO) Anesthesiologist (n = 1).

There was a statistically significant difference noted for MDAs performing preoperative evaluations (p = 0.024) with post hoc analysis showing that the differences between the ≥4 and Unclassifiable service types accounted for this significant finding (Bonferonni corrected, p ≥ 0.05). Specifically, MDAs were most likely to perform preoperative evaluations (54.2%) for the ≥4 service type and least likely (20.0%) to be responsible for these evaluations for the Unclassifiable service type. MDs, CRNAs, and other provider types were not statistically significant by service type (p > 0.05). Overall, ASCs reported that one to three different personnel types were responsible for conducting preoperative evaluations, a finding which was not statistically significant for total number of providers performing these evaluations (p > 0.05).

*Table 14. Providers Responsible for Performing Preoperative Evaluation by Service Type*

| | **Service Type[1]** | | | | | |
|---|---|---|---|---|---|---|
| | **All** | **Ortho** | **GI** | **Eye** | **≥4** | **Unclassifiable[2]** |

| **Provider Type** | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
|---|---|---|---|---|---|---|
| MD[3] | 79 (54.9) | 6 (60.0) | 14 (51.9) | 14 (48.3) | 24 (50.0) | 21 (70.0) |
| *MDA[4] | 53 (36.8) | 2 (20.0)$_{a,b}$ | 9 (33.3) $_{a,b}$ | 10 (34.5) $_{a,b}$ | 26 (54.2)$_{b}$ | 6 (20.0)$_{a}$ |
| CRNA[5] | 64 (44.4) | 3 (30.0) | 15 (55.6) | 16 (55.2) | 19 (39.6) | 11 (36.7) |
| Other | 6 (4.2) | 0 (0.0) | 1 (3.7) | 2 (6.9) | 2 (4.2) | 1 (3.3) |
| **Total Providers Performing Preoperative Evaluation Per Case** | | | | | | |
| 1 | 95 (66.0) | 9 (90.0) | 18 (66.7) | 19 (65.5) | 28 (58.3) | 21 (70.0) |
| 2 | 40 (27.8) | 1 (10.0) | 6 (22.2) | 7 (24.1) | 17 (35.4) | 9 (30.0) |
| 3 | 9 (6.3) | 0 (0.0) | 3 (11.1) | 3 (10.3) | 3 (6.3) | 0 (0.0) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]MD= Medical Doctor
[4]MDA= Medical Doctor of Anesthesia
[5]CRNA= Certified Registered Nurse Anesthetist

*Indicates a statistically significant finding of $p \leq 0.05$

Note: Participants were able to select more than one answer for this item.

*Responsible provider: Patient discharge*. A similar question was asked regarding which personnel were responsible for performing patient discharge home after procedure completion. Overall, the majority of respondents (108 of 144, 75%) reported that an MD was responsible for

patient discharge. Participants reported similar numbers for MDAs (54 of 144, 37.5%) and CRNAs (50 of 144, 34.7%) being accountable for patient discharge. Six (4.2%) reported that someone other than these personnel types were responsible for discharging patients home including Postoperative RN (n = 4), Perioperative RN (n = 1), and Anesthesia DO (n = 1). There was no statistically significant ($p > 0.05$) difference noted for provider types based on service type.

*Timing of preoperative evaluation* (Table 15). Another survey item was asked regarding the percentage of preoperative evaluations performed at various time points. Respondents indicated that the majority (128 of 144) of preoperative evaluations were performed the day of surgery with a median of 100% (IQR 35.0, 100.0) done on the same day. A similar number of participants reported that evaluations were conducted the day before the procedure (39 of 144) or greater than one day to less than seven days prior to procedures (41 of 144). The time frame least reported the least for performing preoperative evaluations was greater than one week before procedures (19 of 144). There was no statistically significant difference observed for preoperative evaluation performance timing based on service type ($p > 0.05$).

*Table 15. Timing of Preoperative Evaluation Performance by Service Type*

| | | **Service Type[1]** | | | | |
|---|---|---|---|---|---|---|
| | **All (n=144)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=29)** | **>4 (n=48)** | **Unclassifiable[2] (n=30)** |
| **>1 week before** | | | | | | |
| Median | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IQR | 0.0, 0.0 | 0.0, 1.3 | 0.0, 0.0 | 0.0, 0.0 | 0.0, 0.0 | 0.0, 0.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **>1 day to ≤7 prior** | | | | | | |
| Median | .00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IQR | 0.0, 5.0 | 0.0, 31.3 | 0.0, 0.0 | 0.0, 0.0 | 25.0 | 0.0, 0.0 |
| **Day Before** | | | | | | |
| Median | .00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IQR | 0.0, 2.0 | 0.0, 10.0 | 0.0, 0.0 | 0.0, 0.0 | 0.0, 10.0 | 0.0, 0.0 |
| **Same Day** | | | | | | |
| Median | 100.0 | 90 | 100.0 | 100.0 | 95.0 | 100.0 |
| IQR | 35.0, 100.0 | 38.8,100.0 | 100.0,100.0 | 47.5,100.0 | 10.0,100.0 | 3.8, 100.0 |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.

*Hospital transfer arrangement* (Table 16). More than half (55.6%) of all respondents reported that the deciding factor for transferring a patient to the hospital was based on a transfer agreement with a predetermined hospital. Distance or travel proximity to the hospital was reported by 41.7% of respondents as the deciding factor for hospital selection while almost a quarter (23.6%) made the decision to transfer to a certain hospital based on surgeon hospital affiliation. Few respondents (16%) reported "Other" deciding factors for determining which

hospital to transfer a patient including: patient request (n = 14), Emergency Medical Services (EMS) preference (n = 3), and physician preference (n = 2). Additionally, one respondent reported that hospital selection was "sometimes insurance driven" while another responded that "hospital transfer agreements were not required" for this facility. Deciding factors for hospital transfer arrangement were not statistically significant by service type ($p > 0.05$).

*Table 16. Hospital Transfer Arrangement Deciding Factor by Service Type*

| | | **Service Type[1]** | | | | |
|---|---|---|---|---|---|---|
| | **All (n=144)** | **Ortho (n=10)** | **GI (n=27)** | **Eye (n=29)** | **≥4 (n=48)** | **Unclassifiable[2] (n=30)** |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| **Deciding Factor** | | | | | | |
| **Surgeon Hospital Affiliation** | 34 (23.6) | 2 (20.0) | 7 (25.9) | 4 (13.8) | 12 (25.0) | 9 (30.0) |
| **Predetermined Hospital** | 80 (55.6) | 6 (60.0) | 18 (66.7) | 13 (44.8) | 25 (52.1) | 18 (60.0) |
| **Hospital Travel Distance/Time** | 60 (41.7) | 3 (30.0) | 11 (40.7) | 14 (48.3) | 21 (43.7) | 11 (36.7) |
| **Other[3]** | 23 (16.0) | 1 (10.0) | 5 (18.5) | 4 (13.8) | 10 (20.8) | 3 (10.0) |

[1]Ortho includes all centers performing only orthopedic or orthopedic and 1 or 2 orthopedic related services such as hand or foot procedures in addition to orthopedic services. GI includes all centers performing only gastrointestinal or 1 or 2 other related procedures in addition to gastrointestinal procedures. Eye includes all centers performing only eye procedures and 1 or 2 other related procedures (e.g. plastic surgery) in addition to eye procedures, ≥4 includes centers performing four or more procedure types that are unrelated. An example is a center that reported performing orthopedic, gastrointestinal, hand and podiatric services.
[2]Unclassifiable include centers that reported individual specialties that did not sum to at least ten. An example is a center that reported only performing pain services.
[3]Other indicates other factors used for hospital transfer decision-making (e.g. patient hospital choice).

*Indicates a statistically significant finding of p≤0.05

Note: Participants were able to select more than one answer for this item.

**Specific Aim 3:** To determine the relationships of state regulations and ambulatory surgery center institutional policies.

Questions relating to state regulation and institutional policy included inquiries on written policies and whether or not each facility has a state license, third party accreditation, and CMS certification. Additional survey items addressed per-diem and contract employment for RNs and CRNAs, type of anesthesia model used, and what provider types were expected to perform preoperative anesthesia evaluations and patient discharge home.

*Written policies* (Table 17). All participants reported having a written policy for adverse event reporting (100%) and hospital transport (100%). Nearly all reported having a mission statement (140 of 141, 99.3%) and a policy for quality monitoring (139 of 141, 98.6%). Most respondents (122 of 141, 86.5%) reported they had a vision statement, over three quarters (111 of 141, 78.7%) reported a written policy for overtime work, and over half (77 of 141, 54.6%) reported having a written policy regarding patient ratios. ASCs in least regulated states (30 of 141, 61.2%) were reported to be more likely to have a policy regarding patient ratios than those in the most regulated (47 of 141, 51.1%) states. There was no statistically significant difference ($p \leq 0.05$) observed for written policies based on level of state regulation.

*Table 17. Written Policies by Regulation Status[1] (N=141)*

| **Written Policy** | **All** | **Most Regulated[2]** n= 92 | **Least Regulated[3]** n= 49 |
|---|---|---|---|
| Mission Statement | 140 (99.3) | 91 (98.9) | 49 (100.0) |
| Vision Statement | 122 (86.5) | 78 (84.8) | 44 (89.8) |

| | | | |
|---|---|---|---|
| Quality Monitoring | 139 (98.6) | 91 (98.9) | 48 (98.0) |
| Adverse Event Reporting | 141 (100.0) | 92 (100.0) | 49 (100.0) |
| Hospital Transport | 141 (100.0) | 92 (100.0) | 49 (100.0) |
| Overtime Work | 111 (78.7) | 68 (73.9) | 43 (87.8) |
| Patient Ratios | 77 (54.6) | 47 (51.1) | 30 (61.2) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).

*Regulatory and Accreditations* (Table 18). Overall, the majority of respondents reported they were CMS-certified (131 of 141, 92.9%) and accredited by a third-party (123 of 141, 87.2%). Nearly two-thirds (104 of 141, 73.8%) of participants reported holding a state license. Of those centers possessing third-party accreditation, the majority (105 of 141, 74.5%) were accredited by the Accreditation Association for Ambulatory Health Care (AAAHC). A statistically significant difference ($p < 0.001$) was observed for state licensure by state regulation status with a higher percentage of ASCs in least regulated states (48 of 141, 98.0%) reported to hold licenses when compared to those in most regulated states (56 of 141, 60.9%). ASCs in Least regulated states (47 of 141, 95.9%) were statistically significantly more likely ($p = 0.024$) to be accredited than those in the most regulated states (76 of 141, 82.6%). There was no statistically significant difference noted with third-party accrediting bodies ($p > 0.05$) or whether or not an ASC was CMS-certificated ($p > 0.05$) by service type.

*Table 18. Regulatory Process Types by Regulation Status[1](N=141)*

| **Regulatory Process Types** | **All** | **Most Regulated[2]** | **Least Regulated[3]** |
|---|---|---|---|

| | n (%) | n (%) | n (%) |
|---|---|---|---|
| *State Licensure | 104 (73.8) | 56 (60.9)$_a$ | 48 (98.0)$_b$ |
| *Third-party Accredited | 123 (87.2) | 76 (82.6)$_a$ | 47 (95.9)$_b$ |
| AAAASF[4] | 5 (3.5) | 4 (4.3) | 1 (2.0) |
| AAAHC[5] | 105 (74.5) | 65 (70.7) | 40 (81.6) |
| Joint Commission | 23 (16.3) | 15 (16.3) | 8 (16.3) |
| CMS-certified | 131 (92.9) | 84 (91.3) | 47 (95.9) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]AAASF= American Association for Accreditation of Ambulatory Surgical Facilities
[5]AAAHC= Accreditation Association for Ambulatory Health Care

* Indicates a statistically significant finding of $p \leq 0.05$

Note: Participants were able to select more than one answer for this item.

*Flexible employment: Per-diem and contract* (Table 19). Overall, nearly all ASCs (136 of 141, 96.5%) reported employing inhouse per-diem RNs while few (5 of 141, 3.5%) reported using agency RNs. CRNAs were mostly reported as contracted employees (34 of 78, 43.6%) when compared to agency-employed (23 of 78, 29.5%), inhouse (20 of 78, 25.6%), or hospital-employed (1 of 78, 1.3%). There was no statistically significant difference in per-diem, contract, or hospital worker types based by regulation status ($p > 0.05$).

*Table 19. Types of Workers Employed by Regulation Status[1](N=141)*

| Worker Types | All | Most Regulated[2] | Least Regulated[3] |
|---|---|---|---|
| | n (%) | n (%) | n (%) |
| Inhouse Per-diem RN | 136 (96.5) | 88 (95.7) | 48 (98.0) |
| Agency Per-diem RN | 5 (3.5) | 2 (2.2) | 3 (6.1) |
| Inhouse Per-diem CRNA | 20 (25.6) | 14 (24.5) | 6 (28.6) |
| Agency Per-diem CRNA | 23 (29.5) | 17 (29.9) | 6 (28.6) |
| Contracted CRNA | 34 (43.6) | 25 (43.9) | 9 (42.8) |
| CRNA via Hospital System | 1 (1.3) | 1 (1.7) | 0 (0.0) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]AAASF= American Association for Accreditation of Ambulatory Surgical Facilities
[5]AAAHC= Accreditation Association for Ambulatory Health Care

Note: Participants were able to select more than one answer for this item

Note: Data in table represents only those centers who reported employing above provider types

*Anesthesia Model* (Table 20). Both the MDA-only model and the CRNA practicing autonomously model differed based on regulatory status ($p < 0.001$). Post hoc analysis revealed that ASCs in least regulated states (21 of 141, 42.9%) were more likely to report using an MDA-only model (11 of 141, 12.0%) than ASCs in the most regulated states. ASCs in the most regulated states tended to use the autonomous CRNA model (26 of 141, 28.3%) more often than the least regulated states (3 of 141, 6.1%). There were no statistically significant differences noted in any other anesthesia model types by regulatory status ($p > 0.05$).

*Table 20. Anesthesia Models by Regulatory Status[1](N=141)*

| Anesthesia Model | All | Most Regulated[2] | Least Regulated[3] |
|---|---|---|---|
| | n (%) | n (%) | n (%) |
| *MDA-only[4] | 32 (22.7) | 11 (12.0)$_a$ | 21 (42.9)$_b$ |
| *CRNA Practicing Autonmously[5] | 29 (20.6) | 26 (28.3)$_a$ | 3 (6.1)$_b$ |
| CRNA under Medical Direction[6] | 17 (12.1) | 9 (9.8) | 8 (16.3) |
| CRNA under Medical Supervision[7] | 17 (12.1) | 14 (15.2) | 3 (6.1) |
| Both MDAs and CRNAs provide Anesthesia | 28 (19.9) | 19 (20.7) | 9 (18.4) |
| Other | 18 (12.8) | 13 (14.1) | 5 (10.2) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]CRNA practicing Autonomously= Only Independent Certified Registered Nurse Anesthetist directly provides anesthesia services
[5]MDA-only= Only Medical Doctor of Anesthesia directly provides anesthesia services
[6]CRNA under Medical Supervision= CRNA provides anesthesia services under the supervision of a physician
[7]CRNA under Medical Direction= CRNA provides anesthesia services under the direction of a Medical Doctor of Anesthesia

* Indicates a statistically significant finding of $p \leq 0.05$

*Personnel responsible: Preoperative anesthesia evaluation* (Table 21a). Overall, over a quarter of ASCs reported that the MD (38 of 140, 27.1%) was the sole provider responsible for performing the anesthesia preoperative evaluation. Over a third (27 of 77, 37.1%) of ASCs that employed MDAs reported them as provider responsible for performing the anesthesia preoperative evaluation. In the least regulated states (43.2%) MDAs were reported in greater percentage than in the most regulated states (27.5%). Over a third (26 of 91, 28.6%) of those ASCs that employed CRNAs reported them as the sole individual who conducted these evaluations. More ASCs in the most regulated states (33.8%) reported that CRNAs were solely

responsible for preoperative evaluations than in the least regulated states (13%). ASCs that reported two providers were responsible for preoperative evaluation reported both MDs and CRNAs (24.2%) were responsible most of the time. The most regulated states (19 of 68, 27.9%) reported MDs and CRNAs as responsible more frequently than the least regulated states (3 of 23, 13.0%). There was no statistically significant difference observed in personnel or groups of personnel by regulation status ($p > 0.05$).

*Table 21a. Individual Responsible for Performing Preoperative Evaluation by Regulation Status[1] (N=140)*

| **Responsible Individual** | **All** n (%) | **Most Regulated[2]** n (%) | **Least Regulated[3]** n (%) |
|---|---|---|---|
| MD[4] only | 38 / 140 (27.1) | 23 / 91 (25.3) | 15 / 49 (30.6) |
| MDA[5] only | 27 / 77 (35.1) | 11 / 40 (27.5) | 16 / 37 (43.2) |
| CRNA[6] only | 26 / 91 (28.6) | 23 / 68 (33.8) | 3 / 23 (13.0) |
| MD and MDA | 9 / 77 (11.7) | 4 / 40 (10.0) | 5 / 37 (13.5) |
| MD and CRNA | 22 / 91 (24.2) | 19 / 68 (27.9) | 3 / 23 (13.0) |
| MDA and CRNA | 5 / 43 (11.6) | 2 / 27 (7.4) | 3 / 16 (18.8) |
| MD, MDA, and CRNA | 8 / 43 (18.6) | 6 / 27 (22.2) | 2 / 16 (12.5) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]MD= Medical Doctor
[5]MDA= Medical Doctor of Anesthesia
[6]CRNA= Certified Registered Nurse Anesthetist

Data for individuals responsible for performing preoperative evaluations was also analyzed with consideration to only those ASCs that reportedly employed MDs, MDAs, and CRNAs (N=42) (Table 21b). Overall, MDs only and MDAs only were reported with the same frequency (n=10) as the sole persons responsible for discharging patients. CRNAs only were reported the least (n= 1) as responsible for preoperative evaluations. When two responsible providers were reported, both the MD and CRNA (14%) were reported most often. Some (n=8)

ASCs reported that the MD, MDA, and CRNA were all responsible for performing the anesthesia preoperative evaluation. ASCs in the most regulated states (22.2%) reported that all three providers were responsible more frequently than in the least regulated states (12.5%). There was no statistically significant difference observed in personnel or groups of personnel by regulation status ($p > 0.05$).

*Table 21b. Provider Responsible for Performing Preoperative Evaluation by Regulation Status[1] (N=42)*

| **Responsible Individual** | **All** n (%) | **Most Regulated[2]** n (%) | **Least Regulated[3]** n (%) |
|---|---|---|---|
| MD[4] only | 10 (23.3) | 7 (25.9) | 3 (18.8) |
| MDA[5] only | 10 (23.3) | 5 (18.5) | 5 (31.3) |
| CRNA[6] only | 1 (2.3) | 1 (3.7) | 0 (0.0) |
| MD and MDA | 3 (7.0) | 1 (3.7) | 2 (12.5) |
| MD and CRNA | 6 (14.0) | 5 (18.5) | 1 (6.3) |
| MDA and CRNA | 5 (11.6) | 2 (7.4) | 3 (18.8) |
| MD, MDA, and CRNA | 8 (18.6) | 6 (22.2) | 2 (12.5) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]MD= Medical Doctor
[5]MDA= Medical Doctor of Anesthesia
[6]CRNA= Certified Registered Nurse Anesthetist

Note: Most Regulated (N=27) and Least Regulated (N= 16).

Note: Data in table represents only those centers who reported employing MDs, MDAs, and CRNAs.

*Responsible provider: Patient discharge* (Table 22a). Overall, ASCs in the most regulated states reported that MDs only (34.1%) were responsible for performing patient discharge duties more often than the least regulated states. Of those ASCs that employed CRNAs (n= 91), when the CRNA-only was reportedly responsible for discharging patients this was reported only by the most regulated states (11.8%). A greater percentage of ASCs in the least

regulated states reportedly (40.5%) expected MDAs-only to discharge patients than in the most regulated states (20.5%). ASCs that reported two providers were responsible for patient discharge reported the both MDs and CRNAs were responsible most of the time. There was no statistically significant difference observed in personnel or groups of personnel by regulation status ($p > 0.05$).

*Table 22a. Providers Responsible for Performing patient Discharge by Regulation Status*[1] (N=139)

| **Responsible Individual** | **All** n (%) | **Most Regulated**[2] n (%) | **Least Regulated**[3] n (%) |
|---|---|---|---|
| MD[4] only | 47 / 139 (33.8) | 31 / 91 (34.1) | 16 / 48 (33.3) |
| MDA[5] only | 23 / 76 (30.3) | 8 / 39 (20.5) | 15 / 37 (40.5) |
| CRNA[6] only | 8 / 91 (8.8) | 8 / 68 (11.8) | 0 / 23 (0.0) |
| MD and MDA | 19 / 76 (25.0) | 11 / 39 (28.2) | 8 / 37 (21.6) |
| MD and CRNA | 28 / 91 (30.8) | 23 / 68 (33.8) | 5 / 23 (21.7) |
| MDA and CRNA | 1 / 43 (2.3) | 1 / 27 (3.7) | 0 / 16 (0.0) |
| MD, MDA, and CRNA | 7 / 43 (16.3) | 6 / 27 (22.2) | 1 / 16 (6.3) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]MD= Medical Doctor
[5]MDA= Medical Doctor of Anesthesia
[6]CRNA= Certified Registered Nurse Anesthetist

Data for individuals responsible for performing patient discharge duties was also analyzed for only those ASCs that reportedly employed MDs, MDAs, and CRNAs (N=42) (Table 22b). Overall, MDs only and MDAs only were reported with the same frequency (n=14) as the sole persons responsible for discharging patients. CRNAs only were not reported as providers with discharge responsibilities (n= 0). When two responsible providers were reported,

both the MD and MDA (18.5%) were reported most often. There was no statistically significant difference observed in personnel or groups of personnel by regulation status ($p > 0.05$).

*Table 22b. Individual Responsible for Performing patient Discharge by Regulation Status*[1] (N=42)

| **Responsible Individual** | **All** n (%) | **Most Regulated**[2] n (%) | **Least Regulated**[3] n (%) |
|---|---|---|---|
| MD[4] | 12 (28.6) | 8 (29.6) | 4 (26.7) |
| MDA[5] | 12 (28.6) | 4 (14.8) | 8 (53.3) |
| CRNA[6] | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| MD and MDA | 6 (14.3) | 5 (18.5) | 1 (6.7) |
| MD and CRNA | 4 (9.5) | 3 (11.1) | 1 (6.7) |
| MDA and CRNA | 1 (2.4) | 1 (3.7) | 0 (0.0) |
| MD, MDA, and CRNA | 7 (16.7) | 6 (22.2) | 1 (6.7) |

[1]State regulation status refers to mandates set forth at the individual state level for ASC regulatory oversight to include: obtaining a certificate of need, fulfilling state licensure requirements, or acquiring accreditation from an approved third-party accreditation agency.
[2]Most-regulated states are those requiring certificate of need, state licensure, and third-party accreditation (CT, NY, DE, VA, and NV).
[3]Least-regulated states are those not requiring certificate of need, state licensure, and third-party accreditation (ID, WI, IA, VE, and PA).
[4]MD= Medical Doctor
[5]MDA= Medical Doctor of Anesthesia
[6]CRNA= Certified Registered Nurse Anesthetist

Note: Data in table represents only centers who reported employing MDs, MDAs, and CRNAs.

# Chapter Five

## 5.1 Meaning of Findings in Relation to Research Aims

This dissertation was guided by the Minnick and Roberts Outcomes Production Model. This is the first time the theoretical framework has been used in the ambulatory surgery setting outside of hospitals. The study begins to fill the gap in describing temporal conditions, workload requirements, labor quality, anesthesia delivery structure, remuneration, nursing personnel functions, and regulation and institutional policy in ASCs. Descriptions of these variables are necessary to establish a foundation for the study of outcomes in this practice setting. The contents of this chapter include a review of the study response rate, detailed discussion for each research aim, strengths and limitations, and recommendations for future study.

### Sample Characteristics

The estimated survey response rate for administrators at large organizations is approximately 32% (Cycyota & Harrison, 2006). Examination of prior Vanderbilt University School of Nursing dissertations found that overall response rates when nursing leadership or administration was studied was 16.7-39%. (C.A. Maxwell, 2007; Gigli-Hittle, 2012; Werthaman, 2019). Based on nursing leadership response rates reported in the literature and response rates from recent dissertation studies using the similar methods, the initial estimated response rate for this dissertation was projected to be 32-50%. The final response rate for this study was 20.7% after correcting for undeliverable mail and facility closures.

There was a significant difference in response rates by regulation status. The least regulated states accounted for nearly two-thirds (63.9%) of responses when compared to the most regulated states. It is suspected that state ASC closures due to the COVID-19 played a role in study participation from some states. At the time of data collection, NY and CT, states in the

highly regulated group, were the most hard-hit states affected by the pandemic. It is possible that mandated ASC closures and stay-at-home safety measures may have affected the ability of ASC administrators to access mail delivered to centers in these states as well as in others. Overall, a lower than desirable response rate for this study limits the generalizability of these results as the data may not be fully representative.

The National Clinical Outcomes Registry (NACOR) contains detailed information about inpatient and ambulatory procedures, including data on patient ASA status. The most recent NACOR report indicated that 59% of procedures in the registry were performed on patients classified as either ASA 1 or ASA2 (ASA, 2019). The percentage of services provided for ASA 1 and ASA 2 patients in this dissertation study was slightly higher at 72.88%. This variation may be explained by the fact that the NACOR registry contains data for both inpatient and ambulatory surgeries, while the primary focus of this study was the ASC setting.

Of those ASCs that reportedly were not accredited (n= 19), it was interesting that over two-thirds (68.4%) of those ASCs were in the state of Wisconsin which is a low regulated state. Nearly half of these ASCs (n= 9) reportedly performed orthopedic and hand surgery or eye (n= 8) procedures. It was also unusual that two respondents in New York reported they were not third-party accredited despite this state being a state that requires it. The majority of ASCs were reportedly accredited by AAAHC (72.9%). Less than a fifth reported accreditation by Joint Commission (17.4%), and 3.5% were accredited by AAAASF. About (32%) of those who reported accreditation by Joint Commission also reported the ASC did not hold a state license despite being located in a state that requires it. It was an interesting finding these ASCs reported Joint Commission accreditation because Joint Commission will not accredit freestanding ASCs unless they are licensed by the state when licensure is required (APSF, 2010). There are two

possible explanations for this: respondents were unaware of their current license status and answered incorrectly or these ASCs reporting not holding a state license truly lacked licensure. It is recommended that future researchers consult state licensure databases and accreditation lists to verify ASC licensure and accreditation status.

**Specific Aim 1:** To describe nursing work conditions in ambulatory surgery centers in the United States.

*Labor Quantity: Types of Personnel*. There was a variation in the percentage of ASCs reporting they employed RNs, LPNs, CRNAs, and OR Technicians. This difference was not statistically significant by service type. A recent national nursing workforce survey found that RNs account for over four-fifths (82.6%) of the nursing workforce while LPN/LVNs constitute 17.4% (Smiley, et. al, 2018). In the hospital setting, RNs comprise the majority of the nursing workforce (99.8%) and LPN/LVNs account for 0.2% of all nursing personnel. The present study confirmed that RNs represent a large proportion of the ASC workforce. Perioperative RNs and Circulating RNs were reportedly employed in nearly all ASCs. Almost 30% (29.9%) of ASCs in this study employed at least some LPN/LVNs. A similar statistic for hospitals was not readily available for comparison.

With the exception of CRNAs, ASCs in this study generally employed full time nursing employees. This tendency toward full time RN employment has also been supported in two large scale national workforce studies. The Health Resources and Services Administration (HRSA) Bureau of Health Workforce Analysis (2018) found that most (78.9%) RN respondents were employed full-time. The 2017 National Nursing Workforce Survey also found that almost two thirds (65.4%) of RNs reported they worked full time (Smiley, et. al, 2018). This workforce survey also found that most (65%) LPN/LVNs were employed full time (Smiley, et. Al, 2018).

The findings in this study are important for workforce recruitment. The higher overall employment of full-time nursing staff is reassuring. Research has shown that hospital units using only full-time nurses reported decreased patient falls and medication errors versus other staffing arrangements (Bae, Mark, & Fried, 2010). The use of mainly full-time staff has also been shown to promote continuity of care (Bae, Mark, & Fried, 2010).

*Flexible employment: Per-diem and contract*. Flexible staffing appointments have been noted to potentially promote a more desirable work environment for nurses. Many hospitals utilize flexible staffing options as a strategy to recruit nurses, particularly during times of nurse shortage (Oppell & Young, 2018). Of those ASCs (n= 139, 96.5%) in this study that reported RNs with a flexible employment status, most were in house per-diems (96.5%). Use of CRNAs in flexible employment show were more frequently reported as contracted (43.6%) than agency (29.5%), inhouse per-diem (25.6%), or hospital employed (1.3%). The frequency in which anesthesiologist are employed as flexible employees was not considered in this study due to a primary focus on nursing. Further research is needed to examine what percentage of work hours flexible employees represent in ASCs and what impact they have recruitment and patient outcomes.

*Labor Quantity: Number of staff.* In this study, the number of Circulating RNs and Perioperative RNs employed at ASCs providing Ortho and ≥4 service types were higher than other service types. Overall, greater numbers of full time OR technicians, CRNAs, and Scrub RNs were reported for the Ortho service type than any other service type. However, these findings were not adjusted for case volume or case severity adjustments that should be considered for future studies. The number of staff may be related to service type and procedural volume. Recommendations for researchers planning future studies in examining nursing staffing

include a greater focus on service types. This may be accomplished by surveying only those ASCs that provide the service type of interest or by utilizing a more targeted strategy for survey items that would generate responses geared toward highlighting service types. It is also recommended that future studies adjust for volume of procedures because this is likely to contribute to greater staffing needs.

*Number of patients: Concurrent.* Nursing workload is typically measured in terms of nurse to patient ratios or total nursing hours per patient day (Lee, MacPhee, & Dahinten, 2018). There was relatively little variation observed in the number of patients assigned concurrently to each worker type. Responses indicated that most often (49.0%) at ASCs Perioperative RNs are responsible for caring for two concurrent patients. The majority of ASCs (96.8%) reported Circulating RNs and Scrub RNs (98%) care for only one patient at a time. This finding is consistent with the Association of Perioperative Registered Nurses (AORN) position statement which delineates that a Circulating RN and a Scrub RN should be assigned to only one patient at a time (AORN, 2019). Nearly all (98.4%) of ASC administrators reported that OR Technicians were responsible for caring for one patient at a time. More than half (53.5%) of respondents reported that LPN/LVNs were assigned one patient at a time although the remaining administrators reported assigning these workers anywhere from two to ten concurrent patients. This variation may have to do with the duties they are assigned. This should be explained in future research. Overall, these data are reassuring with regard to adherence to patient safety staffing standards.

Although the results were not statistically significant by service type there was some variation noted for this variable across ASCs for Perioperative RNs and LPN/LVNs especially in the GI and Eye service type. These variations may be attributed to specific preoperative and

postoperative duties. It is possible that perioperative RNs may have been assigned more concurrent patients if they were assigned strictly to preoperative duties such as initial patient intake and assessment and starting intravenous lines. Preoperative duties involve more documentation-related duties and less need for continuous patient assessment duties because preoperative patients have not yet received any anesthetic medications. For this reason, it is possible that these RNs may be assigned more preoperative patients than postoperative patients. Research regarding duties of perioperative nurses who are concurrently caring for greater than one patient is needed.

In addition, most ASCs may have a policy regarding minimum postoperative recovery time for patients before discharge is permitted. The presence of such a policy may influence how many patients a perioperative RN may be assigned if he or she is responsible for recovering patient postoperatively. Facility-specific policies regarding Phase I and Phase II recovery may play a role in patient assignment during this period of care. The American Society of PeriAnesthesia Nurses (ASPAN) recommends that during Phase I the patient's vital signs should be taken every 15 minutes for the first hour and every 30 minutes thereafter (ASPAN, 2019). During Phase I patient priorities include ensuring hemodynamic stability and airway stability, while Phase II involves a more alert and mobile patient. In Phase II nursing responsibilities include managing pain, ensuring adequate oral intake, and providing patient education prior to discharge (ASPAN, 2019). Similarly, the number of concurrent patients assigned to LPN/LVNs may also be influenced by specific preoperative and postoperative care duties this type of worker is responsible for performing. Recommendations for research include focused questions regarding the types of postoperative policies in place at ASCs to determine how institutional policy affects patient assignment during the postoperative period.

*Number of patients: Per shift.* The overall median number of patients assigned to each provider type per shift was 7.75-9 with IQRs from 5 to 14. Reported numbers for total patients assigned to Perioperative RNs per shift showed the most variation of all worker types. Variation in perioperative patient assignment is might be explained by factors such as procedure length, patient acuity, provider skill mix, practice standards, and state staffing laws (AORN, 2019).

In this study, RNs were most often assigned to a greater number of patients per shift were in eye and GI services where procedures are generally shorter in duration. Statistically significant variations in the number of patients assigned per shift were found with all workers except LPN/LVNs. The GI and Eye service types accounted for the higher number of patients assigned per shift. This may be attributed to shorter procedure length and postoperative recovery time for these types of services. Median procedure time for laser eye surgery in ASCs is two minutes with a range of one to 11 minutes, and discharge time for eye procedures such as cataract surgery is 6 minutes (Beckers, 2019). Colonoscopy procedures performed at ASCs average eight to 23 minutes in duration with postoperative recovery times ranging from 16-52 minutes in duration (Beckers, 2019). Both of these service types represent procedures with shorter length of time to completion and recovery time than other procedures. In comparison, knee arthroscopy, which is often used for ASC benchmarking because of its presumed short duration, takes a median of 24 minutes to perform and results in recovery room stay of approximately 67 minutes for patients (Beckers, 2019).

*Temporal conditions: Work hours and days of service*. Overall, mean work hours were similar (34 – 36.7 hours per week) across all worker types. OR technicians tended to work slightly fewer hours per week in the Eye and GI service types which may attributed to the shorter length of these procedures. Daily shift length for personnel on weekdays and on weekends were

also similar with an approximate average 8-hour shift length for all workers. Less than one-tenth (n=14) of ASCs reportedly provided weekend services with ≥4 and Unclassifiable service types accounting for more than half (n=8) of the services provided on weekends.

These findings are reassuring as they fall in line with the AORN's position statement that Perioperative RNs should not be required to perform direct patient care for more than 12 consecutive hours in a day or more than 60 hours in a full week (AORN, 2014). Many hospital settings worldwide have transitioned to 12-hour nursing shifts in efforts to improve efficiency and address nursing shortages (Dall'Ora, Griffiths, & Ball, 2016). Implementing 12-hour nursing shifts has been found to be helpful in attracting staff who desire regular days off, however, there have been deleterious effects on patient safety cited in the literature (Banakhar, 2017; Baillie & Thomas, 2018; Gyllensten, Anderson, & Muller, 2017). The Joint Commission has cited that 153 out of the 394 reported sentinel events, unanticipated events that typically result in serious injury or death, might have been due to staffing issues such as longer working hours (Joint Commission, 2014). Additional evidence suggests associations between longer shift lengths on mortality and adverse effects on patient care, reduced patient satisfaction with care, and nurse confidence regarding patient safety (Dall'Ora, et. Al, 2018).

Several authors have also reported that nursing shift lengths of 12 hours or greater were more likely to be missed due to employee sickness or absence than shift lengths of eight hours or less (Banakhar, 2017; Baillie & Thomas, 2018; Dall'Ora et. Al, 2018; Gyllensten, Anderson, & Muller, 2017). It has been reported that RNs who worked shifts of 12 hours or greater 75% of time in a work have 27% higher odds of calling out sick compared to those who did not work any 12-hour shifts in a week (Stimpfel, Sloane, Aiken, 2012). In addition, nurses who work shifts of 12 hours or longer are 40% more likely to report decreased job satisfaction compared to

nurses who work shifts of 8 hours or less (Dall'Ora, et. Al, 2018). Nurses working shifts of at least 12 hours are also 29% more likely to report their desire to resign than those working 8-hour shifts (Dall'Ora, et. Al, 2018).

Overall, work hours reported for RNs and LPN/LVNs in this study indicate that these providers work shorter shifts when compared to those working in the hospital setting and do not work on weekends. This may allow recruitment and retention of specific nursing labor segments who find these conditions more desirable than those offered in the hospital setting. ASCs also offer minimal services on the weekend which is also a distinct factor from hospitals. Determining who is part of these labor segments (e.g. by age, experience, social factors) is a topic for future workforce research regarding recruitment and retention of the nursing workforce.

*Scheduling process and schedule type*. Analysis of RN scheduling procedures indicated that the majority of shifts were assigned by an individual other than the worker (88.2%). Fixed Assigned (44.4%), Fixed Self-Scheduling (4.9%), and Flexible Assigned (43.8%) scheduling types were statistically significantly different by service type. In the GI service type, shifts tended to be Fixed Assigned (74.1%), while the ≥ 4 service type tended to use Flexible Assigned (45.8%) scheduling. Most often, Fixed Self-scheduling was used in the Unclassifiable service type. Scheduling methods have not been well-studied in the ASC setting but future research in this area is needed because organizing and controlling nurse scheduling have been found to be two primary factors associated with nurse job satisfaction level (Rizany et. Al, 2019). It is also recommended that future researchers consider the influence of service types when examining nurse scheduling and staffing needs. Given that most ASCs use eight-hour shifts and do not function on weekends, control of scheduling may be of less importance in influencing job satisfaction in ASCs than in hospitals.

*Remuneration*. There was minimal variation in average salaries for Scrub RNs ($70,000), Circulating RNs ($69,057), and Perioperative RNs ($67,000). These figures are consistent with the average ($70,600) perioperative staff nursing salary (Bacon & Stewart, 2017). National data indicates that the average salary for LPN/LVNs ranges from $34,560 to $63,360 (Smiley, et. al, 2018). LPN/LVNs were the nursing personnel reported to have the lowest average annual salary ($47,507), however, there are some limitations to the interpretation of this finding. LPN/LVN salaries are only rough comparisons because this study includes several states that provide lower paying salaries for this type of worker.

There are several factors that influence nursing salary. Variables that have been recognized to affect perioperative nurse compensation include gender, work experience, payment method, education level, union status, and geographic location (AORN, 2017). It is also noted that OR size may play a role in perioperative nursing pay with slightly higher salaries observed for nursing personnel employed at facilities with 10 ORs or greater (AORN, 2017). It is also important to note that employee benefits and other forms of compensation, such as sign on bonuses are linked to employee satisfaction (AORN, 2017; Colosi, 2020). It is recommended that future studies on nurse retention and recruitment investigate further investigate the influence of these variables in the ASC setting.

*Anesthesia Model*. The most frequently reported anesthesia model used in ASCs was the MDA-only (22.9%) followed by the CRNA-only model (20.1%). Unfortunately, national statistics that would enable comparisons with hospitals were not possible because most studies have examined anesthesia models with regard to procedure types. Overall, findings for the MDA-only model were not surprising in light of available evidence. A recent doctoral candidate examining the use of various anesthesia models in the hospital setting showed the MDA-model

was the most reportedly used (41.9%) model (Hewer, 2018). Interestingly, the findings for the current study did not mirror results for the CRNA-only anesthesia model found in the study performed by Hewer (2018) where the CRNA-only model was reportedly the least used anesthesia model (3.1%). A possible explanation for this difference in reported CRNA-only anesthesia models may be that Hewer's (2018) study used the National Sample Medicare Provider Limited Data Set which was inclusive of 5% of anesthesia billing data for of all states.

In this study, the Medically-directed model was reportedly used at 13.2% of ASCs. A recent AANA Annual Member Profile Survey showed that medical direction was at least sometimes used two thirds of the time in hospitals (68.3%) and in settings other than the hospitals (65.8%) where anesthesia care was provided (AANA, 2020). Another study performed within the Veteran's Health Administration (VA) found that 31.6% of surgical cases were performed by MDAs only while 11.7% were performed by CRNAs practicing without supervision (Annis, 2018). This study noted that more than half of these procedures (56.8%) were performed using the Medically-supervised model. Of note, this study was performed at a time when the VA was only beginning to utilize the more CRNA-autonomous model.

The present dissertation study suggests that ASCs may represent a setting in which CRNAs may work with more autonomy with regard to medical supervision and medical direction than hospitals. There is a possibility that opt-out states (n= 3), those which are exempt of the federal supervision requirement for Part A Medicare reimbursement, could explain this finding. CRNAs function within the state based on state law, however, the impact of opt-out status may be associated with greater autonomy of CRNA practice within the state. A recommendation for the future study of anesthesia models include a more detailed focus on opt-

out status. Another recommendation for future research would be the addition of survey items to differentiate anesthesia models based on procedure types. Specifically, focused questions are needed for ASCs reporting use of the Mixed model to determine which type of anesthesia provider is assigned to which procedure type.

*CRNA Remuneration.* The most frequently reported CRNA remuneration model was fee-for-service (27.2%). Another interesting finding was that nearly a quarter (24%) of ASC administrators that responded to this survey indicated that they were unsure of how CRNAs were compensated because they were paid through an outside source. It is recommended that future studies examining methods for CRNA remuneration models plan on verifying forms of remuneration models with the groups who are known to employ them.

**Specific Aim 2**: To describe the functions of licensed nursing personnel in ambulatory surgery centers.

*Provider duties*. Overall, provider duties were generally consistent with accepted professional standards for RNs and OR Technicians. The responses were interesting with regards to patient duties reportedly performed by LPN/LVNs. Nearly a third (32.6%) of ASC administrators reported that LPN/LVNs were responsible for performing patient assessment. The functions that LPN/LVNs are able to perform are specifically delineated in each state's Nurse Practice Act. Generally, most LPN/LVNs provide services such as collecting and reporting patient data and do not conduct comprehensive patient assessments. Another interesting finding was that over two-fifths of ASCs (41.9%) reported LPN/LVNs were assigned to making follow-up phone calls to patients. Data were not collected such as whether LPN/LVNs making these calls had received special training or if an institutional protocol was in place for personally

addressing patient issues or deferring medical concerns to an RN. This study did not query the exact elements of assessments that the LPN/LVNs performed. Future studies regarding what elements are included in LPN/LVN assessments are recommended.

It was also interesting that slightly less than two-thirds (62.2%) of ASC administrators reported that CRNAs were responsible for patient assessment. The AANA (2019) Standards for Nurse Anesthesia Practice specify that anesthesia-focused assessment must be performed to establish anesthesia plan of care. It is also the responsibility of the CRNA to monitor, evaluate, and document the patient's condition throughout the delivery of the anesthetic (AANA, 2019). This includes monitoring blood pressure, heart rate, and respiration at a minimum of every five minutes during anesthesia and adjusting anesthetics or providing interventions based on these assessments (AANA, 2019).

In future studies it is important to determine what elements of assessment are being performed. In particular, it was not known whether those respondents who reported LPN/LVNs performing patient assessment expected these workers to conduct initial, comprehensive, focused, or recurring assessments on the same patient. In the case of CRNAs, it is possible that respondents interpreted this item to refer to specific patient assessment documentation carried out by other worker types, rather than the act of assessing the patient's physical status while under anesthesia. It is possible that respondents may have made the distinction that caring for patients under anesthesia may be more of a monitoring duty rather than one where monitoring and assessment are occurring simultaneously. Similarly, it is suggested that items pertaining to CRNA patient assessment contain more detail regarding specific aspects of the assessment.

*Assignment of nursing care by models*. There was variation noted in continuity of assignment across the operative experience. There are some important observations based on the

analysis of nursing care assignment pattern. Nearly two-thirds (63.2%) of respondents reported that a different RN performed preoperative, intraoperative, and postoperative care for the same patient. Some of these differences in nursing assignment may be explained by the complexity of the services provided and type of anesthesia used. When nursing assignment pattern was reported as the same RN performing all care for the same patient (7.6%), urologic, orthopedic, gastrointestinal, pain, and podiatry procedures accounted for all of these responses. In this study urologic, pain, and podiatry services reported using primarily local anesthesia or oral anxiolysis as anesthesia. Those procedures, in addition to GI, are typically less complex than other surgeries and can be performed in a short duration of time.

Gastrointestinal, eye, and orthopedic service types accounted for the assignment pattern in which the same RN performs only preop and postop care for the same patient (22.2%). As previously mentioned, GI and Eye procedures are typically the shortest ASC procedures and patients experience a shorter LOS with these services than any other service. Future research into the effect of continuity of nursing care offered by each of these types of care assignment and effects on postoperative outcomes is needed. Additionally, study into the differences in outcomes based on service type and complexity of surgeries by nursing care assignment should also be included.

Respondents in the Unclassifiable service type reported the highest proportion of use for the pattern in which the same RN provides care to the same patient or the same RN cares for the only preoperatively and postoperatively for the Unclassifiable service type. Throughout the operative experience the ≥4 service type reported the highest proportion for the use of the assignment pattern in which a different RN was responsible for the same patient preoperatively, intraoperatively, and postoperatively. A recommendation for future researchers would be to

examine the workflow of nurses when caring for patients by procedure if the ASC offers a variety of service types.

Several studies have been performed on the effects of provider continuity and patient outcomes in various settings such as the emergency room department (Marshall et. al, 2015), pediatric intensive care unit (Siow et. al, 2013), and home health (Rusell et. al, 2011; David et. al, 2011). Literature supports that increased provider continuity is associated with better patient outcomes and improved levels of patient satisfaction (Walraven et. al, 2010). Research also suggests that ensuring provider continuity increases safety, reduces costs, decreases emergency department utilization (Stifter et. al, 2015). Literature on anesthesia providers and operating room providers has also shown that changes in providers throughout procedures were independently associated with an increase in postoperative complications (Bohmen et. al, 2016). Further study on the effect of patient assignment models in ASCs on outcomes is another area for study.

*Responsible provider: Preoperative anesthesia evaluation and patient discharge*. There was variation in the type and total number of providers responsible for performing preoperative anesthesia evaluations and patient discharge per case. MDs were the most frequently reported individuals responsible for both anesthesia preoperative evaluations and patient discharge. About half (54.9%) of administrators reported that MDs performed preoperative anesthesia evaluations and three-quarters (75%) reported that MDs were responsible for patient discharge. MDAs exhibited a statistically significant difference for the performance of preoperative anesthesia evaluations for the ≥4 service type (54.6%).

It was interesting that many respondents reported two or three providers responsible for preoperative anesthesia evaluation and discharge. Of those ASCs in which two individuals were

responsible for preoperative evaluation (27.8%), more than half (57.5%) reported those providers as the MD and CRNA. More than a quarter (27.5%) of respondents reported MD and MDA, 12.5% reported MDA and CRNA, and 2.5% reported MDAs and other providers such as DO or RN as responsible for preoperative evaluation. A similar pattern was noted for patient discharge when two providers were indicated with the majority (59.3%) reporting it was MD and CRNA. About a third (33.3%) reported MD and MDA, 5.9% reported MDA and CRNA, and 1.9% reported MD and other providers such as DO or RN as responsible for patient discharge. Future research on the effect of the type and number of individuals performing these responsibilities on outcomes should be examined.

*Timing of preoperative evaluation*. The majority of ASCs (89%) of anesthesia preoperative evaluations are performed the same day as surgery. This finding differs from current hospital practice trends which have shifted toward the use of preoperative anesthesia evaluation clinics. Preoperative evaluation clinics have gained popularity because they reduce length of stay and result in fewer postoperative complications (Bradford et. al. 2018; Schubert, 2017). Evaluations performed in preoperative clinics ahead of scheduled surgery time are associated with a reduction in in-hospital mortality (Blitz, 2016). Performing anesthesia evaluations before the day of surgery has also been found to decrease first case tardiness and turnover time between procedures (Schubert, 2017). The literature also shows that unknown pre-existing medical issues and patient noncompliance with medication contribute to many costly same day surgery cancellations (Bradford et. al. 2018; Schubert, 2017).

There is a possibility that respondents may have interpreted this item differently than intended. It is suggested that future studies on this topic include more detailed choices regarding specific elements of the preoperative assessment. It is possible that respondents perform a

thorough preoperative anesthesia evaluation the day of surgery but may also conduct other preoperative tests or evaluations prior to the scheduled procedure date. Specific information such as timing for obtaining medical and cardiac clearances and lab work was not a focus of this study. It is recommended that future studies ask focused questions about these aspects of the preoperative anesthesia assessment. It is also recommended that researchers examine data on preoperative assessment by service type due to the variation in complexity of cases performed in ASCs that, in turn, may affect what preoperative testing is needed.

*Hospital transfer agreement*. There was variation in the reported factors involved in hospital transfer arrangements. More than half (55.6%) of ASCs reported that a predetermined hospital was used when transfer for additional patient care was needed. About two-fifths of ASCs reported transfer agreements were based on hospital distance/travel time and about a quarter of hospital transfers were determined by surgeon hospital affiliation. The remaining respondents reported that other factors (16%), such as patient and EMT preference determined which hospital a patient was transferred to from the ASC. Interestingly, during this dissertation CMS removed previous requirements for 42 CFR 416.41(b)(3) which addressed hospitalization following ASC surgery. Changes to this rule mean that ASCs do not have to hold an official written transfer agreement or hospital planning privileges for all physicians, but instead must provide hospitals with information about the ASC such as hours of operation and patient population (Dyrda, 2019). CMS cites this change was made to prevent hospitals who provide outpatient surgical services from refusing to sign transfer agreements or grant admitting privileges to physicians performing surgery at ASCs (Dyrda, 2019). This change has led to mixed reviews by ASCs and hospital administration (Dyrda, 2019). It is recommended that

future research examine whether the change of this rule has impacted administrator decision-making for determining hospital transfer, if needed.

**Specific Aim 3**: To determine the relationships of state regulations and ambulatory surgery center institutional policies.

*Written policies*. All respondents reported that their ASCs had a written policy for adverse event reporting and hospital transport. Nearly all (99.3%) reported they had a mission statement and a policy for quality monitoring. Most ASCs reported having a vision statement (86.5%) and a policy for overtime work (78.7%). There was very no significant difference noted between the most regulated and least regulated states in terms of having these policies in place at ASCs. These findings are reassuring for both providers and patients in terms of safety and quality mechanisms. The most interesting policy finding was that only approximately half of respondents reported having a policy regarding patient ratios (54.6%). An explanation for this may be that the absence of a specific policy for provider-to-patient ratios does not play a major role in the number of patients assigned, which is evidenced by the relatively consistent number of patients concurrently assigned to each provider type as mentioned under the discussion of Aim 2 of this study.

*Regulatory and accreditations*. As noted earlier in this chapter, most ASCs reported CMS-certification (92.9%), state licensures (73.8%), and third-party accreditations (87.2%). There was a statistically significant difference in state licensure and third-party accreditation by regulatory category. A higher percentage (98%) of ASCs in least regulated states reported holding a state license than ASCs in the most regulated states (60.9%) category. Similarly, a higher percentage (95.9%) of ASCs in least regulated states reported accreditation by a third-

party than those in the most regulated states (82.6%). This is another reassuring finding because although licensure and accreditation are not required in the least regulated states, ASCs in least regulated states opted to undergo these additional types of regulatory oversight. In some states, obtaining accreditation through a national accrediting organization also results in a "deemed status" in which CMS may deem an ASC to be in compliance with Medicare's conditions for receiving payment for procedures.

*Anesthesia model*. The MDA-only (22.7%) and the CRNA practicing autonomously model (20.6%) were the two most frequently reported anesthesia models used at respondent ASCs. Statistically significant differences were noted between these models when examined by state regulation. When the MDA-only model was used at ASCs, it was reported more often in least regulated states (42.9%) than in most regulated states (12%). It was surprising to the researcher that in light of that finding, a greater percentage of ASCs in the most regulated states (28.3%) reported the model for CRNAs practicing autonomously than in least regulated states (6.1%). Future studies are needed to examine how professional regulation affects the type of anesthesia model used in the ASC setting.

*Personnel responsible: Preoperative anesthesia evaluation and patient discharge*. Overall, over a third (35.1%) of ASCs reported that MDAs had some responsibility for performing anesthesia preoperative evaluations while less than a third (28.6%) reported that CRNAs had some responsibility for these evaluations. When MDAs were reported as responsible by ASCs, they were reported more often in the least regulated states (43.2%) than in the most regulated states (33.8%). In contrast, when CRNAs were responsible for these evaluations, they were reported more often in the most regulated states (13%) than in the least regulated states (0%). ASCs that employed both MDAs and CRNAs reported MDA only (23.3%) more often

than the CRNA only (2.3%) as responsible for preoperative evaluations. There were minimal differences noted by regulatory status.

Overall, nearly a third (30.3%) of ASCs reported that MDAs only were responsible for patient discharge while less than a tenth (8.8%) reported that CRNAs only were responsible. When MDAs were reported as responsible by ASCs, they were again reported more often in the least regulated states (40.5%) than in the most regulated states (20.5%). When ASCs reported that CRNAs were responsible for these evaluations, they were reported more often in the most regulated states (11.8%) than in the least regulated states (0%). ASCs that employed both MDAs and CRNAs reported MDA only (28.6%) more often than the CRNA only (0%) as responsible for discharging patients. One sixth (7 of 42, 16.7%) of these ASCs reported that the MD, MDA, and CRNA were all responsible for patient discharge responsibilities. There were minimal differences noted by regulatory status. It was surprising to the researcher that CRNAs were reported the least as the sole provider conducting anesthesia assessments and discharge despite findings that the autonomous CRNA model was the second most reported practice model in this study. Future studies on the effect of professional regulation and responsibilities for performing preoperative evaluations and patient discharge are needed.

## 5.2 Strengths and Limitations

A major strength of this study is the use of a well-studied conceptual framework that has been used across multiple healthcare settings. The variables used in the Minnick and Roberts Outcome Production Model closely aligned with concepts of interest for the aims of this dissertation. The model was used as the foundation for this study and was a guide for developing the items used in this survey study. Another strength of this study was a review of the literature

conducted by the PI on state regulation which helped to ensure that states that were both most regulated and least regulated, in terms of state mandates, were included for participation. Survey preparation was also a strength of this study. Items were carefully thought out ensuring that concepts of interest were supported by the theoretical framework and that definitions for these concepts were thoroughly tested. Cord sorting was performed to assure that concepts were clear and that any weaknesses noted in descriptions provided for the concepts were considered and addressed. The survey was also pilot tested by experts in survey research and anesthesia provision to ensure that items were clear and appropriate for the concepts being examined.

Another major strength of this dissertation is that there have been no prior studies on working conditions, nursing personnel functions, or regulation and institutional policy in the ASC setting. The use of a survey as the method to gather this descriptive data is an additional strength because survey methods allow researchers to obtain individual perspectives at a large-scale level (Jones, Baxter, & Khanduja, 2013). Surveys are also useful for collecting descriptive and exploratory data and can incorporate an array of various aspects of a topic (Frechtling, 2002). The survey method allowed for gathering descriptive data on multiple variables in an otherwise unstudied healthcare setting. The surveys were also sent directly to ASCs administrators in order to obtain the most definitive descriptions for the variables used in this dissertation study.

A limitation of this study was a low overall response rate, despite efforts taken at the onset of the study to decrease the likelihood of nonresponse. Pilot testing was used to determine whether survey questions were user-friendly and easy to read easy to read, and requests for sensitive information in the survey were minimized (Dillman et al., 2014). Official institutional postage-paid return mailing envelopes, postcards, introductory letter, and follow-up reminder

were used as strategies to decrease nonresponse (Dillman et al., 2014). Although the response rate is consistent with recent dissertation experiences using survey methods, the small sample size in this study limits generalizability of the findings. However, because there are no prior studies in this phenomenon, this study provides value in being the only data available on these variables in the ASC setting. Another limitation of this survey study is that there is always a possibility that participants may have interpreted survey items differently than intended.

Another limitation to this study is the timing of survey administration. Although unforeseeable, the distribution of survey mailings coincided with the onset of the COVID-19 pandemic. At the time of the first survey mailing, New York was the epicenter of the virus and state mandates had gone into effect to limit its spread. These measures included the mandatory closure of many businesses, including ASCs. Connecticut was also affected with high numbers of confirmed COVID infections and was also subject to such closures. It is uncertain whether administrators at these and other ASCs were checking facility mail during state lockdowns. If mail was checked, it highly likely that is was checked much less often than if ASCs were open for business as usual. It is also a possibility that administrators were faced with the pressing issue of managing staff during a pandemic and figuring out ways to prevent ASCs from permanent closures from lack of procedural revenue with facility closures. These unprecedented competing interests may have also affected administrators' time and interest in participating in this dissertation study.

Another challenge encountered during the pandemic was timely mailing. Throughout the entirety of the data collection period, the United States Postal Services (USPS) was encountering delays in sending outgoing mail and sorting incoming mail. These delays were the result of COVID infection surges and lockdowns across the country that affected the USPS workforce

numbers and hours of operation. It is a possibility that more time allowed between mailings would have been beneficial during these unusual circumstances. It remains unclear the role the COVID-19 pandemic played in response rates.

## 5.3 Implications

Due to the descriptive nature of this study, no recommendations can be made to change current nursing practice or policy based solely on these findings. This study, however, provides valuable information that can be important to ASC administrators concerning workload requirements and worker duties, temporal conditions, and institutional policy. This study also contributes new information on anesthesia services such as daily workload, forms of remuneration, and anesthesia models used for various service types that may be of interest to CRNAs. This dissertation also provides insight into details about the ASC workforce and basic provider functions and responsibilities. The following are overall implications of this dissertation work:

*Implications for Practice*

- This study indicates that the number of staff and patient assignment in ASC may be related to service type and procedural volume.
- Overall, staffing numbers and patient assignment follow national guidelines.
- The findings in this study are important for workforce recruitment.
    - Most ASCs were noted to use eight-hour shifts and do not function on weekends.
- This dissertation suggests that ASCs may represent a setting in which CRNAs may work with more autonomy, but further research is needed.
    - Level of physician supervision may be an important factor in a CRNA's decision to work in ASCs.

- ASCs represent settings in which CRNAs are more often contracted employees than full-time staff.

*Implications for Policy*

- This study establishes that compliance with quality policies and participation in accreditation and licensure activities vary little. Other variables will need to be identified to determine what activities influence outcomes.
    - Although licensure and accreditation are not required in the least regulated states most ASCs opt for this additional regulatory oversight.
- The impact of Medicare's recent 42 CFR 416.41(b)(3) rule change on decision-making for hospital transfer and patient outcomes is not yet known.

*Implications for Research*

- Research in the ASC setting must adopt a greater focus on service types their combinations and procedures.
- Adjustment for case volume or case severity should be considered for future studies.
- The effect of professional regulation on anesthesia practice is an important consideration.

This dissertation offers context and a basis for comparison when examining other non-hospital settings such as office surgery. There is additional value to this study because descriptive studies set the groundwork for studies focusing on associations between variables and outcomes. The foundation established by this study facilitates future outcomes research in ASCs. A detailed summary of these implications and additional research recommendations are described in the section to follow.

## 5.4 Recommendations for Future Research

This dissertation describes key variables relevant to the services provided at ASCs. The study is the first to investigate organizational facets, employment terms, and characteristics of labor in the ASC setting. This work provides a foundation for future relational and causal studies relating to the variables relevant to nursing care in ambulatory surgery settings. There are several suggestions for future investigations that have resulted from this descriptive research. These recommendations are a summary of those already discussed with their rationale in earlier sections of this chapter.

**General Recommendations**

- Investigators should identify service types either by pretesting or the use of serve-specific branching items to facilitate a more in-depth examination of important services such as Orthopedic, Eye, and GI services.
- Researchers should consider the Unclassifiable service type as an area of research for outcome study in the ASC setting. The variation in services with ASCs might influence outcomes.
- Future studies must determine whether different workflow models exist by procedure type. This, in turn, influences outcomes differently (e.g. daily procedural volume may explain the number of patients assigned to RNs).
- Researchers should concentrate on service types performed at higher volumes to enable studies of outcomes.

**Workforce**

- Research is needed to examine the percentage of work hours flexible employees represent in ASCs and their impact on recruitment and patient outcomes.

- Future studies of nursing staffing and nurse scheduling should include a focus on service types.
- Studies of ASC staffing must adjust for the volume of procedures as well as procedure types.
- Future studies of nurse recruitment and retention should investigate the influence of other forms of compensation (e.g. employee benefits, sign-on bonuses, paid time off).

**Workload**

- Identification of specific perioperative nursing duties performed when caring for more than one patient is needed.
- Future studies should include focused questions on postoperative institutional policies to determine their effect on postoperative nursing patient assignment.

**Nursing Functions**

- Future studies should examine the specific elements of assessment assigned to CRNAs and LPN/LVNs.

**Remuneration**

- Research on nursing recruitment and retention should focus on determining the characteristics (e.g. age, experience, social factors) of those labor segments that find working conditions in ASCs more desirable than other settings.
- Future studies examining CRNA remuneration must verify remuneration models with the anesthesia groups known to employ them.

**Anesthesia Models**

- Research on anesthesia models must consider including a focus on opt-out states.

- Investigators researching anesthesia models should include survey items to determine CRNAs and MDAs assignment to cases based on procedure type.

**Preoperative Evaluation and Patient Discharge**

- Future studies examining anesthesia preoperative evaluations must include more detailed item choices regarding specific elements of the assessment (e.g. preoperative testing and obtaining clearances).
- Researchers interested in preoperative anesthesia assessments should examine data by procedure type due to the varying complexity of services offered at ASCs.
- Investigators should perform outcomes research on the effect of the type and number of individuals performing preoperative anesthesia evaluations and patient discharge.
- Researchers must examine how professional regulation effects the types of anesthesia model used in the ASC setting.
- Future studies are needed to investigate the effect of professional regulation on responsibilities for performing anesthesia preoperative evaluations.

**Hospital Transfer**

- Future research on the determining factors influencing hospital transfer from ASCs should examine if the change in rule 42 CFR 416.41(b)(3) has inflenced administrator decision-making for patient transfer.

**Future Directions**

Future directions for the PI based on this dissertation work include determining the occurrence of adverse events and outcomes and their possible relationship to the variables in this study. Concerning this type of research, the PI intends to concentrate only on one service type to achieve a large enough sample size. The PI is also interested in performing an analysis to

determine the effect of nurse anesthesia regulation and state practice laws on the variables in this study. Additionally, the PI would like to examine current recruitment and retention trends for CRNAs in ASCs and investigate factors involved in CRNA job satisfaction and decision to seek and maintain employment in the ASC setting.

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Appendix A

Tables

*Table A1. Licensure, Accreditation, CON, Certified-ASCs, and Census by State*

| State | State Licensure Requirement Listed | Accreditation Requirement Listed | Certificate of Need State for ASCs | Number of CMS- Certified ASCs | State Population |
|---|---|---|---|---|---|
| Alabama | Yes | No | Yes | 35 | 4,874,747 |
| Alaska | Yes | No | Yes | 16 | 739,795 |
| Arizona | Yes | No | No | 181 | 7,016,270 |
| Arkansas | Yes | No | No | 63 | 3,004,279 |
| California | Yes, if ASC wholly or in part owned by physicians; regulated by the State Medical Board | Yes, if General anesthesia used | No | 797 | 39,536,653 |
| Colorado | Yes | No | No | 122 | 5,607,154 |
| Connecticut | Yes | Yes | Yes | 49 | 3,588,184 |
| Delaware | Yes | Yes | Yes | 24 | 961,939 |
| District of Columbia | Yes | No | Yes | 3 | 693,972 |
| Florida | Yes | No | No | 428 | 20,984,400 |
| Georgia | Yes | No | Yes | 352 | 10,429,379 |
| Hawaii | Yes | No | Yes | 21 | 1,427,538 |
| Idaho | No | No | No | 53 | 1,716,943 |
| Illinois | Yes | No | Yes | 127 | 12,802,023 |
| Indiana | Yes | No | No | 121 | 6,666,818 |
| Iowa | No | No | Yes | 24 | 3,145,711 |
| Kansas | Yes | No | No | 64 | 2,913,123 |
| Kentucky | Yes | No | Yes | 34 | 4,454,189 |
| Louisiana | Yes | No | Yes | 83 | 4,684,333 |

| | | | | | |
|---|---|---|---|---|---|
| Maine | Yes | No | Yes | 16 | 1,335,907 |
| Maryland | Yes | No | Yes | 343 | 6,052,177 |
| Massachusetts | Yes | No | Yes | 56 | 6,859,819 |
| Michigan | Yes | No | Yes | 102 | 9,962,311 |
| Minnesota | Yes | No | No | 72 | 5,576,606 |
| Mississippi | Yes | No | Yes | 73 | 2,984,100 |
| Missouri | Yes | No | No | 102 | 6,113,532 |
| Montana | Yes | Yes, can be as a condition for licensure | Yes, for ASCs in counties with fewer than 20,000 people | 17 | 1,050,493 |
| Nebraska | Yes | No | No | 49 | 1,920,076 |
| Nevada | Yes | Yes | Yes | 71 | 2,998,039 |
| New Hampshire | Yes | No | No | 30 | 1,342,795 |
| New Jersey | Yes | Yes | No | 259 | 9,005,644 |
| New Mexico | Yes | No | No | 17 | 2,088,070 |
| New York | Yes | Yes | Yes | 149 | 19,849,399 |
| North Carolina | Yes | Yes***? | Yes | 111 | 10,273,419 |
| North Dakota | Yes | No | No | 13 | 755,393 |
| Ohio | Yes | No | No | 180 | 11,658,609 |
| Oklahoma | Yes | No | No | 43 | 3,930,864 |
| Oregon | Yes | No | No | 85 | 4,142,776 |
| Pennsylvania | Not for “Class A” facilities | Yes, for Class “A” facilities | No | 243 | 12,805,537 |
| Rhode Island | Yes | Yes | Yes, but exemption for a single-practice physician or podiatry ambulatory surgery center is pursuant to R.I. Gen. Laws § 23-15-2(4)(i). | 10 | 1,059,639 |
| South Carolina | Yes | No | Yes | 65 | 5,024,369 |
| South Dakota | Yes | No | No | 17 | 869,666 |

| | | | | | |
|---|---|---|---|---|---|
| Tennessee | Yes | No | Yes | 134 | 6,715,984 |
| Texas | Yes | No | No | 405 | 28,304,596 |
| Utah | Yes | No | No | 41 | 3,101,833 |
| Vermont | No | No | Yes, for specialized centers or portion of a physician's office dedicated to outpatient surgery | 1 | 623,657 |
| Virginia | Yes | Yes | Yes | 52 | 8,470,020 |
| Washington | Yes | No | Yes | 189 | 7,405,743 |
| West Virginia | Yes | No | Yes | 10 | 1,815,857 |
| Wisconsin | No | No | No | 82 | 5,795,483 |
| Wyoming | Yes | No | No | 18 | 579,315 |

*Table A2. Card Sort One Results*

| Question | Temporal Conditions | Workload Requirements | Labor Quantity | Anesthesia Delivery Structure | Remuneration | Functions | State Regulation | Institutional Policy | Percent Agreement |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 50%* |
| 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 75% |
| 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 50%* |
| 4 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 50%* |
| 5 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 6 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 7 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 75% |
| 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 9 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 10 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 11 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 75% |
| 12 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 100% |
| 13 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 100% |
| 14 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 100% |
| 15 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 100% |
| 16 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 75% |
| 17 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 75% |
| 18 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 100% |
| 19 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 100% |
| 20 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 100% |
| 21 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 75% |
| 22 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 75% |
| 23 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 75% |
| 24 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 50%* |
| 25 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0%* |
| 26 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 75% |
| 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 100% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 100% |
| 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 100% |

*Table A3. Card Sort Two Results*

| Question | Temporal Conditions | Workload Requirements | Labor Quantity | Anesthesia Delivery Structure | Remuneration | Functions | State Regulation | Institutional Policy | Percent Agreement |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| 4 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 75% |
| 24 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 50%* |
| 25 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 75% |

*Table A4. Specific Aims Table*

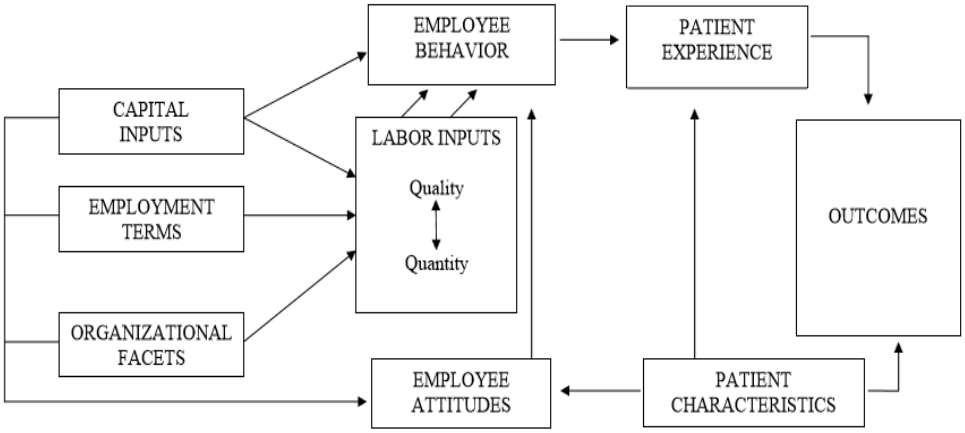
| Specific Aim | Concept | Sub Concept | Definition | Survey Item |
|---|---|---|---|---|
| **Specific Aim 1:** Describe nursing working conditions in ambulatory surgery centers in the United States. | Working conditions | | The working environment and existing circumstances affecting labor in the workplace. This includes aspects such as working time, flexibility of work hours, staff-to-patient ratio, workload, number of nursing staff, job requirements, level of autonomy, and remuneration. | |
| | | Working time | | 2, 3 |
| | | Flexibility with working hours | | 1, 4 |
| | | Staff-to-patient ratio | | 5, 6, 28 |
| | | Workload | | 7, 8, 11 |
| | | Number of nursing staff | | 12, 13, 14, 15 |
| | | Job requirements | | 9, 10, 16 |
| | | Structure | | 21, 22 |
| | | Remuneration | | 18, 19, 20 |
| **Specific Aim 2:** Describe the functions of licensed nursing personnel in | Functions | | Responsibilities and work duties carried out by nurse anesthetists, perioperative nurses, circulating nurses, scrub nurses, and LPNs. | 17, 23, 24, 25 |

| | | | |
|---|---|---|---|
| ambulatory surgery centers. | | | |
| **Specific Aim 3:** Determine the relationships of state regulations and ambulatory surgery center institutional policy. | State regulations | State regulations represent rules established at the individual state-level to control activities and processes for ambulatory surgery centers. | 26, 28 |
| | Institutional policy | Institutional policies are formal written principles or guidelines adopted by an organization in efforts to attain pre-defined goals. | 27, 29 |

Appendix B

Figures

*Figure B1. Minnick and Roberts Outcome Production Model*



Appendix C

## Initial Postcard

Dear [Name],

In approximately two weeks, you will receive a 15-minute survey pertaining to Ambulatory Surgery Centers (ASCs) in the United States. Additional information will be included for those who wish to complete this survey online. Findings from this survey will provide much needed descriptive information on the current state of ASCs. I am an advanced practice nurse currently conducting research in fulfillment of requirements for a PhD in Nursing Science degree at Vanderbilt University School of Nursing, Nashville, Tennessee. Your participation in this study is highly valued.

Sincerely,

Christina Vera PhD(c), DNP, CRNA
Doctoral Candidate
Vanderbilt University School of Nursing

## First Letter Mailing

Dear [Name and Title here],

You are invited to participate in a 15-minute survey that will provide information about Ambulatory Surgery Centers ASCs in the United States. There is a paucity of information about variables that may influence the delivery of patient care in this very unique setting. Your participation will assist in bridging the gap of what is known regarding the current state of ASCs.

Your participation is voluntary and your identity and the identity of your organization and any other affiliated organizations will remain confidential. All data collected will be encrypted and secured. No individual-level data will be disclosed, and only aggregate data will be reported. This study has been reviewed and approved by the Vanderbilt University IRB as Exempt (IRB# HERE).

Please return the enclosed survey by [date] in the addressed, postage-paid envelope provided. You may also complete the survey online via the following link: [web link]. This link is part of REDCap, a secure, encrypted, web-based application designed to support data capture.

The study results will be made available as a presentation and submitted for publication in a peer-reviewed journal in approximately one year after study completion. If you have any questions, please contact me at Christina.Vera@Vanderbilt.edu, or my PhD advisor, Ann Minnick PhD, RN, FAAN, at Ann.Minnick@Vanderbilt.edu.

Thank you for your time and consideration in participating in this important research.

Sincerely,

Christina Vera PhD(c), DNP, CRNA
Doctoral Candidate
Vanderbilt University School of Nursing

[IRB: 191932]

## Second and Third Mailing Letter

Dear [Name and Title here],

Recently, a request was mailed to you asking for your participation in a 15-minute survey designed to gather information about Ambulatory Surgery Centers (ASCs) in the United States. To the best of our knowledge, we have not yet received your responses. We are contacting you again because of the important role you play in bridging the gap on what is known about this unique healthcare setting.

Your participation is voluntary and your identity and the identity of your organization and any other affiliated organizations will remain confidential. All data collected from this research will be encrypted and secured. No individual-level data will be disclosed, and only aggregate data will be reported. This study has been reviewed and approved by the Vanderbilt University IRB as Exempt (IRB# HERE).

Please return the enclosed survey by [date] in the addressed, postage-paid envelope provided. You may also complete the survey online via the following link: [web link]. This link is part of REDCap, a secure, encrypted, web-based application designed to support data capture.

The study results will be made available as a presentation and submitted for publication in a peer-reviewed journal following study completion in approximately one year. If you have any questions, please contact me at Christina.Vera@Vanderbilt.edu, or my PhD advisor, Ann Minnick PhD, RN, FAAN, at Ann.Minnick@Vanderbilt.edu.

Thank you for your time and consideration in participating in this important research.

Sincerely,

Christina Vera PhD(c), DNP, CRNA
Doctoral Candidate
Vanderbilt University School of Nursing

[IRB: 191932]

**Complete Survey**
[IRB: 191932]

INSTRUCTIONS:

- Use the definitions provided below to complete as much of the survey as you can. Any information you can provide will be important.

To Return the Survey:

- Use the postage-paid envelope provided to return the completed survey by [Date].
- This survey may also be completed online. Enter the following link into your web-browser to be automatically directed to this survey: [Weblink here]

Definitions of Terms

Certified Registered Nurse Anesthetist (CRNA): a master's or doctoral-prepared advanced practice nurse who has graduated from an accredited nurse anesthesia program and retains a certification for the administration of anesthesia.

Registered Nurse (RN): a graduate trained nurse who is licensed by state authority after qualifying for registration.

Scrub nurse: a licensed nurse who prepares operating rooms, set up equipment and surgical tools, and assist during surgeries as instructed by the surgeon and/or surgical assistant.

Circulating nurse: a licensed nurse who provides extra support during surgical procedures such obtaining and opening supplies and sterile instruments, performing the surgical count, and assisting in moving patients.

Hospital affiliation: an agreement between a hospital and an ambulatory surgical center wherein the hospital provides care to the plan members.

Licensed Practical Nurse (LPN)/Licensed Vocational Nurse (LVN): a nurse who is trained and licensed by the state authority to provide basic nursing care and medication administration under the supervision of a doctor or nurse.

Medically directed: when an anesthesiologist is involved in two to four concurrent anesthesia procedures or a single anesthesia procedure with a qualified anesthetist. For each anesthesia procedure, the anesthesiologist must do the following *seven required services*: Perform a pre-anesthetic examination and evaluation; prescribe the anesthesia plan; personally participate in the most demanding procedures of the anesthesia plan; ensure that any procedure in the anesthesia plan that he or she does not perform are performed by a qualified anesthetist; monitor the course of anesthesia administration at frequent intervals; remain physically present and available for immediate diagnosis and treatment of emergencies; and provide the indicated post anesthesia care.

Medically supervised: Medical supervision occurs when an anesthesiologist is involved in five or more concurrent anesthesia procedures or when the *seven required services*, described above, are not performed by an anesthesiologist.
Nursing personnel: nurses who have obtained and maintain an active license to practice nursing which include RNs, LPNs/LVNs, CRNAs, and Advanced Registered Nurse Practitioners (APRNs).

Operating Room Technicians: a certified surgical technologist who prepares operating rooms, set up equipment and surgical tools, and assist during surgeries as instructed by the surgeon and/or surgical assistant.

Perioperative nurse: a licensed nurse responsible for any of the following: patient admission processes, starting an intravenous line, giving medications, securing patient belongings, monitoring patients during the recovery process, providing discharge instructions, and documenting patient response to care.

Functions: The responsibilities and work duties carried out by Nurse Anesthetists, Perioperative Nurses, Circulating Nurses, Scrub Nurses, and LPNs/LVNs at the ASC. Examples include FUNCTIONS that are PERFORMED by providers and the responsibilities of providers.

1. What days does this facility provide ambulatory surgical services? (Select all that apply)

   ☐ Monday
   ☐ Tuesday
   ☐ Wednesday
   ☐ Thursday
   ☐ Friday
   ☐ Saturday
   ☐ Sunday

   *If 0, please stop and return the survey

2. What is the average number of hours a week worked by the following providers:

| Provider | # of hours/week |
|---|---|
| CRNAs | _____ |
| RNs | _____ |
| Operating Room Technicians | _____ |
| LPNs/LVNs | _____ |

3. What is the average daily length of shift for each of the following nursing personnel?

| Provider | # Hours/day On Weekdays | # Hours/day On Weekends |
|---|---|---|
| CRNAs | _____ | _____ |
| RNs | _____ | _____ |
| Operating Room Technicians | _____ | _____ |
| LPNs/LVNs | _____ | _____ |

4. At this facility, how is shift scheduling performed by nursing personnel?

   ☐ Provider self-scheduling using pre-determined fixed shifts
   ☐ Provider self-scheduling using flexible hours
   ☐ Assigned scheduling using pre-determined fixed shifts
      If selected, who schedules? _____
   ☐ Assigned scheduling using flexible hours
      If selected, who schedules? _____
   ☐ Other: _____

5. During a typical work shift, how many TOTAL patients will each of the following nursing personnel be assigned? (Indicate N/A if the personnel listed is not employed at your facility)

| Provider | Total # of patients |
|---|---|
| CRNAs | _____ |
| Perioperative Nurses | _____ |
| Circulating Nurses | _____ |
| Scrub Nurses | _____ |
| Operating Room Technicians | _____ |
| LPNs/LVNs | _____ |

6. During a typical work shift, how many patients will each of the following nursing personnel be assigned AT THE SAME TIME? (Indicate N/A if the personnel listed is not employed at your facility)

| Provider | # of Patients at one time |
|---|---|
| CRNAs | _____ |
| Perioperative Nurses | _____ |
| Circulating Nurses | _____ |
| Scrub Nurses | _____ |
| Scrub Technicians | _____ |
| LPNs/LVNs | _____ |

7. Indicate how many surgeries were performed at this facility in the last year? _____

   Of these, approximately how many were performed on WEEKENDS? _____

8. Indicate the types of procedure(s) performed at this institution (Select all that apply)

   ☐ Orthopedic
   ☐ Gynecologic
   ☐ GI/Colorectal
   ☐ Endocrine
   ☐ Neurologic
   ☐ Hand
   ☐ Emergency cases
   ☐ Ear, nose, throat
   ☐ Ophthalmological
   ☐ Dental/maxillofacial
   ☐ Cosmetic/Plastic/Reconstructive
   ☐ Urologic
   ☐ Vascular
   ☐ Other

9. Does your facility provide the following:

| | Yes | No |
|---|---|---|
| Bariatric surgery | ☐ | ☐ |
| Pediatric surgery | ☐ | ☐ |
| Spinal surgery | ☐ | ☐ |
| Laparoscopic surgery | ☐ | ☐ |
| Robotic surgery | ☐ | ☐ |

10. Indicate the approximate number of patients undergoing surgery at this facility defined by the following ASA classifications:

| ASA Classification | # of Patients |
|---|---|
| ASA 1 (Healthy; no disease) | _____ |
| ASA 2 (Mild systemic disease) | _____ |
| ASA 3 (Severe systemic disease) | _____ |
| ASA 4 (Severe systemic disease that is constant threat to life) | _____ |

11. Indicate the average total postoperative length of stay, in minutes, for surgical patients at this facility: _____

12. What is the average number of perioperative RNs practicing at this institution?

| | # of RNs | Not known |
|---|---|---|
| Full time Perioperative RN | _____ | _____ |
| Part time Perioperative RN | _____ | _____ |
| Per-diem Perioperative RN | _____ | _____ |

13. What is the average number of RNs practicing in the operating room at this institution?

| | # of RNs | Not known |
|---|---|---|
| Full time Circulating RN | _____ | _____ |
| Part time Circulating RN | _____ | _____ |
| Per-diem Circulating RN | _____ | _____ |
| Full time Scrub RN | _____ | _____ |
| Part time Scrub RN | _____ | _____ |
| Per-diem Scrub RN | _____ | _____ |

14. What is the average number of CRNAs employed at this institution?

| | # of CRNAs | Not known |
|---|---|---|
| Full time CRNAs | _____ | _____ |
| Part time CRNAs | _____ | _____ |
| Per-diem CRNAs | _____ | _____ |

15. What is the average number of the following staff employed at this institution?

| | # of Staff | Not known |
|---|---|---|
| Full time OR Technicians | _____ | _____ |
| Part time OR Technicians | _____ | _____ |
| Per-diem OR Technicians | _____ | _____ |
| Full time LPNs/LVNs | _____ | _____ |
| Part time LPNs/LVNs | _____ | _____ |
| Per-diem LPNs/LVNs | _____ | _____ |

16. Which of the following describes how perioperative nursing care is assigned at this facility?

☐ The same RN performs all preoperative, intraoperative, and postoperative functions for the same patient

☐ The same RN performs only preoperative and postoperative functions for the same Patient; intraoperatively other nurses care for patients
☐ A different RN is assigned to care for the patient during the preoperative, interoperative, and postoperative period
☐ Personnel other than an RN can care for patients in the preoperative period
☐ Other (Describe): _____

17. Who typically performs the following functions at your institution? (Check all that apply)

| Functions | CRNA | Periop RNs | Circulators | Scrub RNs | OR Techs | LPNs/LVNS | Other |
|---|---|---|---|---|---|---|---|
| Stocking/Restocking (Drugs) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Stocking/Restocking (OR equipment) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Checking emergency (Carts/equipment) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Inventory | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Cleaning | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Patient transport | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Patient assessment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Follow-up calls to patients | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

18. Indicate the model utilized for the provision of anesthesia services at this facility:

☐ MDA working independent
☐ CRNA working independent
☐ CRNA-medically directed
☐ CRNA-medically supervised
☐ Both CRNA and MDA working independently
☐ Other (Specify:) _____

19. If MDA anesthesia services are utilized, who are MDAs employed by?

☐ Ambulatory Surgery Center
☐ Surgical group
☐ An independent anesthesia group
☐ MDAs are not used at this facility
☐ Other (Specify:) _____

20. How are CRNAs compensated at your facility?

☐ Fixed-salary
☐ Fee-for-service
☐ Hourly pay with a minimum of hours guaranteed
☐ Hourly pay with no minimum of hours guaranteed
☐ Not applicable; CRNA services are not utilized at this facility
☐ Other: _____

21. At your institution, who is responsible for performing preoperative anesthesia evaluations? (Select all that apply)

☐ MDs
☐ MDAs
☐ CRNAs
☐ Other (Specify): _____

22. At your institution, who is responsible for evaluating surgical patients for medical discharge?

☐ MD
☐ MDA
☐ DO
☐ Podiatrist
☐ CRNA
☐ APRN
☐ Other (Specify): _____

23. What percentage of the preoperative anesthesia evaluations performed at each time period?

| Time of evaluation: | % |
|---|---|
| The day of surgery | _____ |
| The day before surgery | _____ |
| >1 day to a week prior to surgery | _____ |
| >1 week before surgery | _____ |
| Other | _____ |

24. What is the average salary for each of the following personnel at your institution? (Indicate N/A if the personnel listed is not employed at your facility)

| Personnel | Salary |
|---|---|
| Perioperative nurse | _____ |
| Circulating nurse | _____ |

Scrub nurse _____
Scrub tech _____
LPN/LVN _____

25. Over the past year, approximately how many overtime hours were paid to nursing personnel? _____

26. This ASC is (Select all that apply):

☐ Licensed by the state
☐ Third-party accredited
☐ CMS-certified

If accredited, select accrediting organization (Select all that apply):

☐ American Association for Accreditation of Ambulatory Surgery Centers
☐ Accreditation Association for Ambulatory Health Care
☐ Healthcare Facilities Accreditation Program
☐ Institute for Quality Management in Healthcare
☐ Joint Commission
☐ Other (Specify): _____

27. With what type of hospitals is your facility affiliated with? (Select all that apply)

☐ Teaching hospital-affiliated
☐ Nonteaching hospital-affiliated
☐ Not hospital-affiliated
☐ Other (Specify:) _____

28. If patient hospital transfer were required, how is hospital selection determined? (Select all that apply)

☐ Per surgeon hospital affiliation
☐ Per hospital transfer agreement based on predetermined hospital
☐ Per hospital transfer agreement based on hospital within a certain distance/travel time from the facility
☐ Other (Specify:) _____

29. Does this facility have a written:

| | Yes | No |
|---|---|---|
| Mission Statement | ☐ | ☐ |
| Vision Statement | ☐ | ☐ |
| Quality Monitoring Procedures | ☐ | ☐ |
| Policy for reporting adverse events | ☐ | ☐ |
| Procedures for hospital transport | ☐ | ☐ |
| Policy regarding overtime work | ☐ | ☐ |
| Policy regarding nurse-to-patient ratios | ☐ | ☐ |

**Thank you for your participation in this study!**