Quality, Costs, and Policy: Factors Influencing Choice of Anesthesia Staffing Models

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EXECUTIVE SUMMARY

Certified registered nurse anesthetists (CRNAs) can practice independently or with varying degrees of supervision by physicians or anesthesiologists. Before 2001, the Centers for Medicare & Medicaid Services (CMS) conditions of participation required CRNAs to be supervised by a physician. Starting in November 2001, CMS implemented an opt-out policy to give states greater autonomy in determining how anesthesia services are delivered. The policy also provided a mechanism to increase access to anesthesia services.

We sought to understand and describe surgical facility leaders' perceptions of CRNA quality, safety, and cost-effectiveness; the motivation and rationale for using different anesthesia staffing models; and facilitators and barriers to using CRNAs. We applied a mixed-methods approach to understand surgical facility leadership decision-making for staffing arrangements.

The use of anesthesia staffing models differed by location and surgical facility type. For example, the predominantly CRNA model was used in only 10% of large urban hospitals but in 61% of rural ambulatory surgical centers. Interviews with surgical facility leaders revealed that geographic location, surgeon preference, and organizational inertia were powerful contributors to a facility's choice of staffing model. Other factors included the Medicare opt-out provision, facility experience, and cost considerations. Differences in quality and safety between models were not contributing factors for most facilities.

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INTRODUCTION

Certified registered nurse anesthetists (CRNAs) and anesthesiologists are essential to providing anesthesia services in the United States. According to a review of the Physician Compare database, more than 39,000 CRNAs and 37,000 anesthesiologists are actively billing Medicare (Quraishi, Hoyem, & Jordan, 2018). CRNAs, depending on federal, state, or facility regulations, can practice independently or with varying degrees of physician supervision. Anesthesia staffing arrangements include services delivered by anesthesiologists alone, CRNAs practicing independently or autonomously, or in anesthesiologist–CRNA teams. The challenge of correctly interpreting federal, state, and facility regulations concerning physician supervision of CRNAs, coupled with complex Medicare reimbursement rules, may perpetuate perceived and actual barriers to CRNA full scope-of-practice (SOP) in surgical facilities. The goal of this study, performed under contract with the American Association of Nurse Anesthetists Foundation, was to ascertain surgical facility leaders' perceptions of CRNA quality, safety, and cost-effectiveness in providing anesthesia services and the motivation and rationale for using different anesthesia staffing models.

BACKGROUND

Before 2001, Centers for Medicare & Medicaid Services (CMS) conditions of participation (CoPs) required CRNAs to be supervised by physicians (operating physician *or* immediately available anesthesiologist) for facilities to receive Medicare reimbursement under Part A. Under a January 2001 regulation, elimination of the federal requirement for physician supervision of CRNAs was proposed, but the option to require physician supervision of CRNAs was deferred to the states (Inglis, 2003). In November 2001, CMS added a provision specifying that "the governor of a State, in consultation with the State's Boards of Medicine & Nursing, [can] exercise the option of exemption from this requirement" (Medicare, 2001). This provision, or opt-out policy, gave states greater autonomy in determining the delivery of anesthesia services while maintaining patient quality of care and promoting increased access to anesthesia services.

To date, 17 states have selected the opt-out policy. Although the state exemption allows facilities a clean break from the federal requirement of physician supervision of CRNAs (regardless of physician type), it should be noted that the supervision of CRNAs can be satisfied by an operating practitioner (e.g., surgeon) and does not need to involve an anesthesiologist in states that have not enacted the opt-out policy. It has been difficult to determine the policy's impact on access to anesthesia services, although researchers have found correlations with higher provision of anesthesia services by CRNAs among uninsured, Medicaid, and rural populations (Liao, Quraishi, & Jordan, 2015). Other studies have not found conclusive evidence that the opt-out policy increased access to anesthesia services (Schneider, Ohsfeldt, Li, Miller, & Scheibling, 2017; Sun, Dexter, Miller, & Baker, 2017).

Physician supervision can be interpreted in different ways by various entities. However, Negrusa, Hogan, Warner, Schroeder, and Pang (2016) note that state laws,

including physician supervision terminology such as "immediate presence," "timely onsite consultation," and "physically present and available on the premises," are generally more restrictive of CRNA practice. No state specifically requires physician supervision of a CRNA by an anesthesiologist; however, some surgical facility leaders may choose staffing models that exceed state law requirements because of perceptions that this practice increases anesthesia safety or care quality. Under current state laws, any physician (primarily the surgeon or operating physician) can accept the physician supervision role if required. Therefore, a surgical facility's decision to exceed state law may have additional downstream implications on anesthesia personnel resources needed to meet surgical volume demand.

Regardless of the type of supervising physician, the federal opt-out policy and state laws do not have an impact on the manner in which CRNAs and anesthesiologists are reimbursed for Medicare Part B services under the physician fee schedule; therefore, federal and state laws should not be confused with Medicare reimbursement rules. Given the increasing competition for anesthesia staff, patient volume, and financial pressure facilities face in the current value-based healthcare environment, misconstruing the relationship between supervision regulations (federal or state) and reimbursement rules may present a financial disadvantage for surgical facilities.

Following the Institute of Medicine & Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing report (Institute of Medicine, 2011), encouraging states to enact policies to enable advanced practice registered nurses to practice to their full extent of training and education, interest in CRNA provision of anesthesia services has grown. A Medicare claims trend analysis covering 2000 to 2014 illustrates that a substantial share of anesthesia service claims includes the QZ modifier (an anesthesia claim modifier depicting CRNA service without medical direction by a physician) and, perhaps not coincidentally, constitutes the largest percentage increase of any anesthesia modifier (Quraishi, Jordan, & Hoyem, 2017).

CRNA provision of anesthesia services is a frequent subject in the literature, with numerous findings regarding cost-effectiveness. Many studies show that independent or autonomous CRNA provision of anesthesia services is cost-effective (French, Guzman, Rubio, Frenzel, & Feeley, 2016; Hogan, Seifert, Moore, & Simonson, 2010; Lewin Group, 2016). Other studies compare cost-effectiveness of anesthesiologists providing anesthesia services to CRNAs providing services (Abenstein, Long, McGlinch, & Dietz, 2004; Abouleish, Prough, & Vadhera, 2004). A recent study found increased CRNA-to-anesthesiologist staffing ratios to be potentially cost-saving (French et al., 2016). These studies illustrate the impact Medicare reimbursement rules have on facilities' use of anesthesia personnel and choice of staffing models. Although cost-effectiveness seems clear, perceived or actual federal or state restrictions on CRNA practice may be potential drivers in facilities' use of anesthesia personnel.

Numerous studies have not found differences in quality or safety by anesthesia staffing model across numerous procedures and settings (Coron et al., 2010; Dulisse & Cromwell, 2010; Henrichs et al., 2009;

Lewis, Nicholson, Smith, & Alderson, 2014; Negrusa et al., 2016; Pine, Holt, & Lou, 2003; Simonson, Ahern, & Hendry, 2007). Of particular interest, two studies assessed the quality of anesthesia care in relation to policy (i.e., SOP state laws and regulations and federal opt-out status). Research on Medicare claims conducted by Dulisse and Cromwell in 2010 found no statistical difference in surgical complications or death based on opt-out status and anesthesia staffing models. A 2016 study analyzed 5.7 million commercial anesthesia claims and found no statistical difference in risk of anesthesia-specific complications based on a classification of CRNA SOP restrictive states by inpatient and ambulatory setting and anesthesia staffing models (Negrusa et al., 2016).

Example Semistructured Interview Questions

- What is unique about your facility that influences staffing for anesthesia service delivery?
- How do you staff the operating room with anesthesia providers?
- What is your perception of the cost-effectiveness of using anesthesiologists, CRNAs, or a team model to provide anesthesia services?
- Does cost and quality vary by anesthesia provider type?
- How do you think APMs will impact your facility's use of anesthesia providers?
- How has the Medicare physician supervision opt-out policy influenced your decision to use CRNAs or to not use CRNAs?

METHODS

This study used a mixed-methods approach. We conducted telephone interviews following a semistructured interview protocol. Interview questions centered on the safety, quality, and cost-effectiveness of anesthesia staffing models; use of metrics for anesthesia cost-efficiency; considerations of alternative payment models (APMs) effects; and familiarity with and influence of the Medicare physician supervision opt-out policy.

Protocols were tailored by staffing models used in specific facilities. We used the quantitative analyses to first stratify facilities by location (rural/urban), facility type (large hospital/small hospital/ambulatory surgical center [ASC]), and predominant anesthesia staffing model (independent CRNA/independent anesthesiologist/team) and thus to inform facility selection for interview.

We initially identified 12 facilities in each stratum (2*3*3 = 18 strata) for a total of 216 facilities from the results of the quantitative analysis. We allowed for facility replacement to maintain the initial sample characteristics when a selected facility was not feasible (e.g., if a facility closed). Purposive sampling was nonrandom but allowed us to ensure a sample with a balance of the measured facility characteristics. We contacted an additional 103 facilities to increase the sample size. Ultimately, we contacted 319 facilities, including hospitals, health systems, and ASCs, by sending letters and e-mails and making follow-up phone calls. Phone interviews lasted approximately 30 minutes and were audio-recorded with interviewee permission. Transcripts were imported to NVivo Version 11 (2017) for inductive and deductive content analyses to identify themes (Patton, 2015). Deductive techniques

captured findings responding to interview guide questions. Inductive techniques identified themes that were not part of the original list of questions. We developed a codebook based on key research questions and emerging themes. Two analysts coded the first five transcripts and achieved inter-rater reliability of 92%; remaining interview transcripts were coded independently and reviewed for additional emerging themes. The emerging themes analysis was completed using the coded interview transcripts. The authors reviewed the codes for new themes and discussed and refined these themes to generate conclusions.

For quantitative analysis, we used the 2014 5% Medicare Parts A and B limited dataset claims for a random sample of 1 in 20 Medicare beneficiaries (CMS, 2016). We selected beneficiaries in traditional fee-for-service Medicare in the 50 states and Washington, DC. We identified inpatient surgical claims using Medicare Severity Diagnosis Related Groups. Outpatient and ASC surgical claims were identified using the Healthcare Common Procedure Coding System (codes 10021–69990).

We matched inpatient surgical claims to anesthesia claims using the beneficiary identifier and service dates within three days of the inpatient procedure. We matched outpatient and ASC surgical claims to anesthesia claims using the beneficiary identifier and exact service date. Our sample includes 498,076 surgical claims matched to anesthesia claims.

We classified anesthesia claims using modifier codes that provide information on the anesthesia service provision billed. Each anesthesia claim was classified as one of six anesthesia service provision types (Table 1), and surgical facilities were classified into three anesthesia delivery models—referred to throughout as "anesthesia staffing model(s)." Facilities were classified as predominantly anesthesiologist when 80% or more of the facility's anesthesia claims included the "AA" modifier, as predominantly CRNA when 80% or more of the facility's anesthesia claims included the "QZ" modifier, and as team when they did not meet other classifications. We used the 2014 Medicare Provider of Services file to determine facility rural/urban location

TABLE 1
Defining Anesthesia Service Models

HCPCS Modifier	Anesthesia Service Model
AA	Anesthesia services performed personally by an anesthesiologist
QY	Medical direction of one CRNA/anesthesiologist's assistant (AA) by an anesthesiologist
QX	CRNA/AA service with medical direction by a physician
QK	Medical direction by a physician of two, three, or four concurrent anesthesia procedures
AD	Medically supervised by a physician, more than four concurrent anesthesia procedures
QZ	CRNA/AA service without medical direction by a physician

Source. Centers for Medicare & Medicaid Services, 2016 Alpha-Numeric Healthcare Common Procedure Coding System (HCPCS) File.

and hospital bed size. We classified facilities as ASCs or hospitals and then classified hospitals as large or small by using the 65th percentile of bed size in rural (53 beds) and urban (286 beds) areas separately. We excluded facilities with fewer than 10 matched surgical/anesthesia claims resulting in 6,488 facilities.

In addition to facility classification and selection, the quantitative analyses provided critical context and support for the qualitative results that came from the interviews and analysis allowing for further interpretation and synthesis. We examined the association between anesthesia staffing models and payments for anesthesia services. To calculate anesthesia payments, we summed Medicare payments and beneficiary liabilities on matched surgical and anesthesia claims and averaged by facility.

FINDINGS

Of the 6,440 facilities that we were able to classify, 30% were predominantly CRNA, 26% predominantly anesthesiologist, and 44% team. Most facilities were in non-opt-out states. Almost half of rural facilities were classified as predominantly CRNA compared with about one-quarter of urban facilities. Of rural facilities, 10% were classified as predominantly anesthesiologist compared with 30% of urban facilities (Table 2).

Although rural ASCs were rare, 61% of these were predominantly CRNA compared with 33% of urban ASCs (Table 3). Similarly, 14% of urban hospitals were predominantly CRNA, whereas 44% of rural hospitals were predominantly CRNA.

Of the 46 surgical facility leaders interviewed, 17 represented facilities using predominantly CRNA models, 13 used predominantly anesthesiologist models, 12 used team models, and 4 included providers or anesthesia group leaders working with multiple types of anesthesia staffing models. Examples of interviewees, referred to as surgical facility leaders, were CEOs; chief nursing officers; directors of perioperative services; directors of surgical services; chiefs of anesthesia; anesthesia group leaders; contracted CRNAs from 18 ASCs, 15 small and 9 large hospitals (including 18 urban facilities and 26 rural facilities); and 2 providers who worked in rural and urban locations. A surgical facility leader was anyone with staffing decision-making authority. We identified a list of potential leadership roles

TABLE 2
Facilities, by Anesthesia Provider Mix and Urban/Rural Location

Staffing Model	Urban	Rural	Total
Predominantly CRNA	1,358	571	1,929
	26%	46%	30%
Predominantly anesthesiologist	1,575	126	1,701
	30%	10%	26%
Team	2,268	542	2,810
	44%	44%	44%
Total	5,201	1,239	6,440

Source. CRNA = Certified Registered Nurse Anesthetists. A small number of facilities were missing the rural/urban indicator: 19 predominantly CRNA, 14 predominantly anesthesiologist, and 14 team.

TABLE 3
Facilities, by Anesthesia Staffing Model, Urban/Rural Location, and Facility Type

Facility Type and Location	Predominantly CRNA	Predominantly Anesthesiologist	Team	Total
Urban				
ASC	1,040	982	856	2,878
	36%	34%	30%	100%
Small hospital	220	365	780	1,365
	16%	27%	57%	100%
Large hospital	89	212	621	922
	10%	23%	67%	100%
Total	1,349	1,559	2,257	5,165[a]
	26%	30%	44%	100%
Rural				
ASC	176	45	67	288
	61%	16%	23%	100%
Small hospital	167	26	108	301
	55%	9%	36%	100%
Large hospital	226	55	365	646
	35%	9%	57%	100%
Total	569	126	540	1,235[a]
	46%	10%	44%	100%

Note. ASC = ambulatory surgical center.
[a]Eighty-eight facilities are missing ASC or hospital distinctions.

but also allowed facility staff to identify their leaders during recruitment.

Leadership Understanding of the Opt-Out Policy and its Perceived Influence on Staffing

Most surgical facility leaders knew of the opt-out policy; however, a few had inaccurate perceptions about it. For example, some believed that the CRNA physician supervision requirement specifically called for anesthesiologist supervision, not supervision by any physician. In general, "supervision" was viewed negatively:

> *[Supervision] becomes a barrier because when you say the word "supervision." All of us have worked under supervision, right? You worked at McDonald's at the front counter and there was a manager and they were supervising you, and if you did something stupid, they got in trouble for it, and then you got in trouble for it because [it] rolls downhill. Everyone's perception of the word supervision is that. (Contracted group leader in a rural, predominantly CRNA ASC)*

These negative associations with the term "supervision" compound the complexity of the opt-out policy's impact on anesthesia delivery, perceptions of CRNAs, and liability.

Almost half of surgical facility leaders knew of this provision and surgical facility leaders in opt-out states thought it influenced their facility's practice, whereas those in non-opt-out states thought it would influence their facility's practice. In contrast, two providers indicated the opt-out policy had influenced their facility's anesthesia delivery model; another thought it might influence other facilities, although their facility was already using a predominantly CRNA model.

Those who responded that the opt-out provision influenced model choice noted that it helped mitigate perceived liability and safety risks of using independent CRNAs. One surgical facility leader explained that states using the opt-out provision could influence models by decreasing the likelihood of facility bylaws requiring anesthesiologists "because if that wasn't waived, we'd have a different situation in all of our facilities in the regional areas."

Others thought that exercising the opt-out provision could influence physician and surgical facility leader perception of quality and safety of care provided by independent CRNAs, thus advancing surgical facility leaders' perceptions that public and healthcare providers are more likely to view CRNAs as safe, cost-effective providers if the supervision requirement is removed. However, surgical facility leaders also indicated changing opt-out status alone would not change their facility's model.

Costs

Anesthesia Costs in Advanced Payment Models

Most surgical facility leaders were not familiar with APMs and had not considered their potential effects on anesthesia service provision. We attributed this lack of awareness to APM discussions at corporate levels rather than facility levels. Surgical facility leaders reported using contracted groups more often than directly employing anesthesia providers and had minimal knowledge of anesthesia payments.

Three surgical facility leaders noted their facilities participated in APMs such as an accountable care organization or the Comprehensive Care for Joint Replacement model. However, they had not considered the impact of APMs on anesthesia services or models and had mixed views about effects of APMs on demand for CRNA-provided services. One leader, representing a contracted group at a rural ASC, said bundled payments might lead to increased CRNA use because administrators would prioritize use of lower-cost anesthesia providers. A contracted group leader at an urban ASC stated bundled payments would have a negative impact on contracted CRNAs because facilities may negotiate contracts more aggressively to reduce costs.

Anesthesia Staffing and Anesthesia Cost-Efficiencies

Surgical facility leaders indicated using CRNAs could yield cost-efficiencies. An interviewee representing a small rural hospital stated, "You get more bang for your buck with CRNAs." Another interviewee stated:

> *We were still looking for general anesthesiologists and we filled those positions with locums when we could. But the general consensus was that if we could move towards CRNAs especially for our endoscopies … we could get two CRNAs here for the salary of one anesthesiologist. (Leader in a*

large, rural, predominantly anesthesiologist hospital)

Despite this knowledge, some encountered obstacles transitioning to predominantly CRNA models. A CRNA group leader explained that, although administrators knew a predominantly CRNA model was more cost-effective, surgeons were resistant because of perceptions of increased liability. A leader of a small urban hospital shared that using anesthesiologists was the most expensive model; despite positive experiences working with CRNAs, the hospital was unsuccessful in changing models because of resistance from anesthesiologists. A leader of a large rural hospital employing primarily anesthesiologists recognized that using CRNAs would bring cost-efficiencies, but a transition was delayed because of resistance from senior anesthesiologists.

Anesthesia Staffing Models, Surgical Facility Processes, and Anesthesia Costs

Surgical facility leaders indicated models affected facility costs differently. Most described a team model as cost-effective, with a 1:4 anesthesiologist-to-CRNA ratio. However, if an anesthesiologist covered only two rooms instead of four, the model was not cost-effective. Staff turnover and paying for idle time affected facility costs. One leader suggested it would be more economical to directly employ CRNAs rather than use contracted groups to avoid overtime payments, allowing the facility to operate on a different schedule.

Surgical facility leaders indicated flip rooms (where surgeons rotate between operating rooms and have anesthesia providers immediately available) contributed to higher facility costs because providers were paid for idle time. According to one contracted group provider at an urban ASC with a team model, it would be more cost-effective for surgeons to stay in the same room and turn rooms over quickly. Although one facility leader noted that employing anesthesia providers directly could be more cost-effective, most surgical facility leaders viewed contracting with anesthesia provider groups as cost-effective, allowing the facility to save money by not billing for the anesthesia services or providing insurance for the contracted group. The arrangement also allows facilities to change staff depending on caseload, avoid the need for locum arrangements, or close operating rooms when anesthesia providers are not available.

Payer Reimbursement Rates and Medicare Payments by Facility Type

Reimbursement rates and payer mix influenced models and profit margins. Contracted group leaders noted lower reimbursement rates incentivized use of CRNAs, particularly for Medicare and Medicaid patients. One contracted group provider at a rural ASC explained that cataract procedures are primarily performed for Medicare patients and reimbursed at lower rates, making predominantly CRNA models the best option. Reimbursement rates were reported as directly influencing profit margin—as cost of care increases and anesthesia reimbursement rates decrease, facilities experience lower profit margins.

Our quantitative analysis found anesthesia payments for Medicare patients were

TABLE 4
Mean Payments, by Anesthesia Staffing Model and Urban/Rural Status

Staffing Model	Mean Total Pay: Urban	Mean Total Pay: Rural	Mean Total Pay: All Areas[a]
Predominantly CRNA	$435 ($426, $443)	$289 ($276, $304)	$393 ($385, $401)
Predominantly anesthesiologist	$474 ($464, $484)	$320 ($298, $343)	$464 ($454, $473)
Team	$375 ($368, $382)	$254 ($244, $263)	$353 ($346, $359)
All staffing models	$421 ($416, $426)	$277 ($269, $284)	$394 ($390, $399)

Note. [a]Numbers do not sum exactly because 47 facilities were missing the indicator for urban/rural location but were included in the "all areas" totals.

higher in predominantly anesthesiologist facilities than predominantly CRNA and team facilities, and payments were lowest among team facilities (Table 4). Urban facilities had higher anesthesia payments than rural facilities. Among urban facilities, mean payments for facilities using predominantly anesthesiologist models were higher than for facilities using predominantly CRNA or team models. Rural facilities using predominantly anesthesiologist models also exhibited higher mean payments. All differences were statistically significant at the 95% confidence level. These findings are consistent with current literature indicating payer mix and anesthesia labor costs may influence anesthesia staffing models (French et al., 2016; Hogan et al., 2010; Lewin Group, 2016; Liao et al., 2015). However, we note that respondents' perceptions were based on the facility or group perspective. Coupled with differences in anesthesia provider salary requirements and perceived equivalent quality, facilities that use CRNAs may also realize the cost-effectiveness of CRNAs if the difference in salary requirements between the two types of providers is greater than the difference in payer reimbursement rates for the two types of providers.

Quality and Safety

Several surgical facility leaders shared that facilities used data to assess quality, safety, and cost-effectiveness of anesthesia services; however, these metrics were not used to guide their choices for anesthesia provider types, models, or individual providers. A surgical facility leader representing a small rural hospital indicated that such activity was new to their organization, and their experience with CRNAs was too short to make assessments. Surgical facility leaders who routinely measured quality indicated they did not observe differences in quality between anesthesiologists and CRNAs. Some leaders indicated that perceptions of quality and safety of care were influenced by peer-reviewed literature, which they indicated demonstrated no differences in quality and safety of services across models. The lack of differences in quality between anesthesia staffing models noted in interviews is consistent with scientific literature that has shown no differences in quality or safety across numerous procedures and settings (Coron et al., 2010; Dulisse & Cromwell, 2010; Henrichs et al., 2009; Lewis et al., 2014; Negrusa et al., 2016; Simonson et al., 2007; Pine et al., 2003). Coupled with the lower

cost of CRNA-provided anesthesia services, CRNAs are perceived as providing cost-effective care.

Past experiences with anesthesia providers shaped perceptions of quality and safety and informed decisions regarding anesthesia staffing. Surgical facility leaders with negative experiences with a certain type of provider were less likely to hire or contract with that type. A surgical facility leader of a small, rural, team hospital with positive experiences with CRNAs shared a high level of comfort with CRNAs, stating, "If I came in and required some kind of emergency surgery, I would be very comfortable with either of our CRNAs doing the anesthetic on me."

Some leaders indicated their model varied by type and complexity of anesthesia services. A leader of a CRNA group in a rural area indicated that one facility historically used only anesthesiologists for labor epidurals, although CRNAs were starting to perform epidurals. In contrast, a large urban hospital used anesthesia team arrangements, but used only CRNAs for obstetrical analgesia and anesthesia.

Other Considerations

Access

Most surgical facility leaders said CRNAs were essential to rural communities. A few surgical facility leaders representing rural facilities described facing shortages of other providers (e.g., nurses, surgeons) and decreased volume of cases, which decreased demand for anesthesia providers. A few leaders explained that anesthesiologists perceived rural locations as less desirable, making recruitment difficult. According to several surgical facility leaders, CRNAs were more likely to work independently in rural areas.

> *I don't think they would be able to hire more anesthesiologists to come to our facility … we are either on call or back up every second or third night and we are required to live in town. Most of [the] surgeons don't live in town because they want to be closer to the big city. I don't think it would be successful recruiting for anesthesiologists because of location. (Contracted group leader in rural, mixed facility types)*

Surgical facility leaders from rural locations described providing substantial charity care to patients unable to pay for services and having a high proportion of Medicare and Medicaid patients with lower reimbursement rates. These surgical facility leaders noted the combination of charity care and lower reimbursement rates kept profit margins low, making it difficult to employ anesthesiologists. According to these leaders, many rural facilities would not be viable without independent CRNAs.

Policies

Federal, state, and facility policies have an effect on the use of CRNAs. According to some surgical facility leaders, physicians used lobbyists to limit scope of practice for CRNAs in federal and state policy. However, many leaders said that facility-level policies wielded the most significant influence on anesthesia staffing. For example, a facility in an opt-out state required direct supervision of CRNAs, whereas a facility in a non-opt-out state adopted a facility-level policy enabling greater clinical

independence of CRNAs in delivering anesthesia services.

> *The hardest and most difficult regulations are [going to] be at the facility level. If you write policy and procedures and bylaws to meet state law and to exceed state law so that you protect your facility according to the laws … or slightly broader than that … [then] your tightest laws and rules are [going to] be your facility laws and rules. (Provider in a small, rural, predominantly CRNA hospital)*

A few surgical facility leaders described limited knowledge concerning CRNAs' scope of practice as a barrier to using CRNAs.

> *I think CEOs and hospital administrators do not understand the scope of practice for CRNAs. They are being told by the physicians what our scope is. So, they base it off the physicians instead of the billing. They do not understand a QZ versus a QX. (Contracted group provider in mixed locations)*

Organizational Inertia

Surgical facility leaders described using certain models as a matter of facility tradition. Long-established choices either are never questioned or questioned only when the facility is facing provider shortages or financial troubles. Providers and surgical facility leaders are generally most comfortable with models with which they are familiar. Organizational inertia was present across all facility types, locations, and models. As one leader noted, "We're going to continue this way until we can't anymore." Most surgical facility leaders did not have full insight into long-standing facility decisions regarding anesthesia staffing; they explained that current models were working well, so there were no plans to change.

> *Quite frankly, "I've always done it this way and this is how I just want to keep doing it." That's probably the mentality that is the biggest barrier to either cost or quality as you try to adapt and change—getting over that "this is how I do it" mentality. (Leader in a large, rural, predominantly CRNA hospital)*

Local norms of medical practice also contributed to organizational inertia, particularly in urban locations where perceptions that delivery of anesthesia services required anesthesiologist direction were common. According to a surgical facility leader, representing a large, urban team hospital,

> *We have bylaws that are set up at this hospital and we practice according to the hospital bylaws. There's no push from the CRNAs or the anesthesiologists to go one way or the other. Our relationship right now works and I don't want to change it. (Surgical facility leader in a large, urban team hospital)*

One surgical facility leader elaborated that local norms played a strong role when the facility switched from a predominantly CRNA model to a team model, whereas the standard of care applied at other local hospitals followed a team model. This facility

continued to use a team model because it was also the expectation of surgeons and physicians. However, some surgical facility leaders relied on CRNAs when they could not recruit an anesthesiologist. These situations served as the turning point for using a predominantly CRNA model.

Physician Preference

Many surgical facility leaders described adhering to surgeons' preference for anesthesia providers. Leaders stated that surgeons preferred to work with anesthesiologists rather than CRNAs, although most did not share the rationale for this preference. Others described physicians as champions and advocates for CRNAs once they began to trust their qualifications.

> *Surgeons [play] a big influence in how we partner with anesthesia. And they've had a long working relationship with this group, so, that certainly helps to drive how we're going to approach it. (Leader in a small, rural predominantly anesthesiologist hospital)*

Several surgical facility leaders shared that physicians and anesthesiologists were more likely to have "a seat at the table" concerning facility decisions. As one provider explained, anesthesiologists in their facility had the administration's ear, and the administration eventually proceeded with a costlier model to please them.

> *The surgeons are saying, "I only want an anesthesiologist." … That's typically where it comes from. … The anesthesiologists, they eat by what their surgeons give them. So, if the surgeons don't want CRNAs, it's [going to] be hard for the anesthesiologists to embrace that model. (Leader in a large, urban predominantly anesthesiologist hospital)*

DISCUSSION

Surgical facility leader interviews for this study provided insights into factors influencing facility model choice—and geographic location, surgeon preference, and organizational inertia were powerful contributors. Other factors included the Medicare opt-out provision, facility experience, and cost considerations.

We found that the predominantly CRNA model was most common in rural locations, consistent with prior research findings (Daugherty, Fonseca, Kumar, & Michaud, 2011; Fallacaro & Ruiz-Law, 2004; Greenwood & Biddle, 2015; Kozhimannil et al., 2015; Liao et al., 2015). Surgical facility leaders noted anesthesiologists were more difficult to recruit in rural locations, and anesthesiologist salary requirements were often prohibitive. Team models were equally common in rural and urban facilities. Use of models differed by facility type and rural/urban location.

Almost half of the surgical facility leaders were aware of the opt-out provision and thought it did or would influence facility model choice. It was unclear whether they understood the opt-out policy only applied to the facility CoPs and was not directly related to reimbursement for anesthesia services. Although Medicare requires supervision of CRNAs by an operating practitioner or an immediately available anesthesiologist (except in opt-out states), there appears to be a persistent misunderstanding of CRNA

supervision in terms of the level of oversight and anesthesiologist involvement.

Surgical facility leaders were aware of cost differences attributable to different anesthesia staffing models. Medicare anesthesia service payments were higher in facilities using predominantly anesthesiologist models compared with facilities using predominantly CRNA or team models. These differences may be due to the Medicare geographic price index in the region or patient mix with higher severity relative to other facilities. It is also noteworthy that differences in quality and safety among models were not contributing factors for model choice.

Cost savings and comparable value in terms of quality and for team and predominantly CRNA models were commonly acknowledged among surgical facility leaders and providers. However, facility location, surgeon or anesthesiologist preference, experience, and organizational inertia strongly influenced organizational decision-making. These factors were particularly strong among urban facilities that were less constrained by anesthesiologist availability. Perceived shortages of anesthesia providers can disrupt organizational inertia and negate physician preferences. Although federal, state, and facility policies were reported to influence models in facilities, facility-level policies were reported as most influential.

Study Limitations

This study was not intended to draw causal inference from an in-depth analysis of anesthesia payments. The Medicare 5% limited dataset for our quantitative analysis did not include anesthesia services covered by Medicaid, commercial plans, or the uninsured. The primary purpose of our quantitative analysis was to classify facilities into one of three anesthesia staffing models and provide broad estimates of anesthesia payments and additional context to our qualitative findings.

We also note that our small sample of interviewees may not represent the entirety of views among facility leaders. Selection bias may influence qualitative findings. We cannot rule out the possibility that transparency in disclosing the funder of this research may have influenced people's responses. Finally, we note that respondents from surgical facilities using predominantly CRNA staffing models represent 36% of the interview sample, and surgical facilities using predominantly CRNA staffing models represent 30% of surgical facilities in our claims-based categorization methodology.

CONCLUSION

This study's findings suggest that the opt-out policy alone may not have yielded strong uptake of predominantly CRNA models in opt-out states. Rather, multiple influences shape anesthesia staffing model choice for surgical facilities in opt-out and non-opt-out states. With continued pressure to reduce costs in the healthcare environment (e.g., through APMs), pressures to reduce cost of care in surgical facilities that are fighting for survival in dangerously narrow operating margins will be substantially amplified. Future work should focus on factors that drive facility-level change with respect to costs and variation in surgical episodes of care attributable to anesthesia staffing models.

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PRACTITIONER APPLICATION: Quality, Costs, and Policy: Factors Influencing Choice of Anesthesia Staffing Models

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Since 2001, the Centers for Medicare & Medicaid Services has allowed states to opt out of the requirement to have certified registered nurse anesthetists (CRNAs) supervised by a physician. Currently, 17 states have opted out of the requirement. A primary goal of the opt-out policy was to enhance provision of anesthesia services, although studies have not conclusively proved that it has expanded those services. Even in states with the opt-out policy, surgical facilities can independently choose to require physician supervision for CRNAs. Within that scope of supervision, various anesthesia staffing models exist, ranging from predominantly anesthesiologist to predominantly CRNA. Research has shown that independent delivery of anesthesia services by CRNAs is cost-effective and does not reduce quality.

Mills et al. sought to identify surgical facility leaders' perceptions of CRNA quality, safety, and cost-effectiveness in a study of anesthesia staffing models. They found the predominantly CRNA model was used the majority of time in rural ambulatory surgical centers but rarely in large urban hospitals. Through interviews with surgical facility leaders, the authors learned that the most significant contributing factors to the type of anesthesia staffing model employed were geographic location, surgeon preference, and organizational

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inertia. Surgeon perceptions of increased liability and resistance from senior anesthesiologists were cited as barriers to CRNA use. Facility-level, compared to state-level, policies were observed as the most significant driver of the type of anesthesia staffing models and supervision. Anesthesia payments from Medicare patients were highest in facilities that had predominantly anesthesiologist models.

In our rapidly changing healthcare market, simply doing things the way they have always been done can lead to an organization's demise. Surgical facility leaders should be open to different staffing models and evaluate whether those that employ more CRNAs can lead to increased profitability; evidence demonstrates that quality does not suffer. Nearly an equal number of CRNAs and anesthesiologists exist in the United States, and some markets may not be able to attract anesthesiologists. Particularly in opt-out states, facilities may be able to provide appropriate anesthesia with CRNAs under lower levels of supervision.

Given that the authors found higher anesthesia payments in facilities that used predominantly anesthesiologist models compared to CRNA models, it is unclear whether profitability is higher under the predominantly CRNA model. Profitability should be assessed prior to a shift in staffing models, particularly if the facility has the ability to recruit both anesthesiologists and CRNAs. Understanding that surgeons seemingly have a preference for anesthesiologists over CRNAs, facility leadership should work closely with doctors to implement any transition to the employment of additional CRNAs.