

# Anesthesia Staffing Models and Geographic Prevalence Post-Medicare CRNA/Physician Exemption Policy

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*Three common staffing models for delivering anesthesia exist in the United States: services delivered by anesthesiologists only, services delivered by certified registered nurse anesthetists (CRNAs) only, and services delivered by anesthesiologist and CRNA teams. Given the opt-out policy enacted by the Centers for Medicare & Medicaid Services in 2001, it is reasonable to expect that the use of CRNAs would vary by state opt-out status. Allowing CRNAs to provide anesthesia services independently may help alleviate perceived anesthesiology provider shortages, particularly in rural locations, without adversely affecting patient quality of care while reducing total anesthesia delivery costs.*

Three common anesthesia staffing models for surgical cases in the United States include services delivered by (a) anesthesiologists alone, (b) certified registered nurse anesthetists (CRNAs) alone, and (c) anesthesiologist/CRNA teams (Matsusaki & Sakai, 2011). Before 2001, the Centers for Medicare & Medicaid Services (CMS) conditions of participation required CRNAs to be supervised by a physician (an operating physician *or* an immediately available anesthesiologist). In 1997, CMS started the process to change the conditions of Medicare participation for CRNAs by proposing an exemption for CRNAs from the physician supervision requirement (Jacobson, 2001; Medicare and Medicaid Programs, 2001). The final rule in 2001 cited a lack of scientific evidence supporting the CRNA physician supervision requirement and gave states the option to request an exemption

from the physician supervision requirement (Jacobson, 2001; Medicare and Medicaid Programs, 2001). The exemption requires the governor to consult with the state board of medicine, nursing, and other experts and to submit a written request for exemption in the form of a letter to CMS stating the exemption is in the best interest of the state's citizens.

Two studies of the opt-out policy, examining opt-out states, have not demonstrated a substantial impact of the provision on access to anesthesia services. Sun, Dexter, Miller, and Baker (2017) analyzed Medicare utilization data and found that most opt-out states exhibited smaller growth in anesthesia utilization compared with non-opt-out states. Further, in the same study, opt-out status was found to be associated with little or no increase in access to anesthesia services. Schneider, Ohsfeldt, Li, Miller, and Scheibling (2017) concluded that opt-out status

did not appear to increase access to anesthesia services.

Recent work by Quraishi, Jordan, and Hoyem (2017) included a 15-year trend analysis of Medicare data that found the rate of CRNAs billing for anesthesia services without anesthesiologist medical direction has been increasing, while the rate of anesthesiologists providing anesthesia services alone has been decreasing. Still, there has been a persistent unequal distribution of anesthesia providers across the United States. Particularly, CRNAs tend to be concentrated in rural areas where they are often essential to providing anesthesia services for general surgery and obstetrical care (Daugherty, Fonseca, Kumar, & Michaud, 2011; Doty et al., 2008; Fallacaro & Ruiz-Law, 2004; Greenwood & Biddle, 2015; Kozhimannil et al., 2015; Liao, Quraishi, & Jordan, 2015).

Implementation of the Medicare CRNA physician supervision opt-out provision in 2001 provides opportunity to explore whether this policy has influenced anesthesia staffing models in U.S. hospitals and ambulatory surgery centers (ASCs). Currently, 17 states have exercised the opt-out provision (Schneider et al., 2017). Although studies have found using CRNAs is a cost-effective approach to delivering anesthesia, few have investigated the impact of the opt-out policy on the prevalence of predominantly CRNA models in different surgical facilities and hospitals (Henrichs et al., 2009; Hogan,

Seifert, Moore, & Simonson, 2010).

In this work, researchers classified facilities into three anesthesia staffing models based on the anesthesia modifier codes billed on anesthesiology claims for surgeries performed at the facility: predominantly anesthesiologist, predominantly CRNA, or team. Facilities were classified as ASCs or hospitals; hospitals were further classified as large or small by urban/rural location and bed size. The prevalence of these facilities was assessed by location, facility type and size, and state opt-out status. Predominantly CRNA staffing models did not appear to be more common in opt-out states, yet they were more prevalent in rural areas than urban areas. Further, few facilities in rural areas used predominantly anesthesiologist staffing models regardless of a state's opt-out status. The Medicare CRNA physician supervision opt-out policy alone did not appear to be a primary driver in facilities' choice of anesthesia staffing models; however, individual facility characteristics and rural/urban status did appear to be substantial contributors in determining a facility's anesthesia staffing model. Furthermore, CRNAs do appear to provide access to anesthesia services in areas where those services would not otherwise have been available.

## Materials and Methods

Two data sources were used in the analysis: the 2014 5%

Medicare Parts A and B limited dataset (claims) files and the 2014 Medicare Provider of Services (POS) file (CMS, 2016a, 2016b). The claims data contain all Medicare inpatient, outpatient, physician, and practitioner claims for a random sample of 1 of every 20 Medicare beneficiaries. The POS file provided information regarding facility characteristics including indicators for urban/rural location, facility ownership, bed size, and contact information.

Data were limited to beneficiaries in traditional fee-for-service Medicare living in the 50 states and Washington, DC, retaining only claims where Medicare was the primary payer. Surgical claims were identified in the inpatient, outpatient, and ASC settings and matched with the corresponding claims for anesthesiology services provided by anesthesiologists and CRNAs during the surgery. Facilities with fewer than 10 matched claims were excluded from the analysis. Next, each matched surgical and anesthesia claim set was classified as physician alone, CRNA alone, or team anesthesia service delivery using the Healthcare Common Procedure Coding System code modifier billed on the anesthesiology claim: anesthesiologist alone (AA), CRNA alone (QZ), or team (QK, AD, QY, QX).

Facilities were classified as predominantly anesthesiologist when 80% or more of the facility's anesthesia claims were anesthesiologist alone, as predominantly CRNA when 80%

**Table 1.**  
**Counts of Facilities by Type, Size, and Location**

Facility Type	Number of Facilities	Number of Predominantly Anesthesiologist Facilities	Number of Predominantly CRNA Facilities	Number of Team Facilities
Hospitals	3,234	658	702	1,874
Large urban	922	212	89	621
Large rural	646	55	226	365
Small urban	1,365	365	220	780
Small rural	301	26	167	108
ASCs	3,167	1,027	1,218	922
Urban ASCs	2,878	982	1,041	855
Rural ASCs	289	45	177	67
Total	6,401	1,685	1,920	2,796

ASC = ambulatory surgery centers, CRNA = certified registered nurse anesthetists

or more of the facility's anesthesia claims were CRNA alone, and as team if the facility's claims did not reach either of these thresholds. Researchers also examined 90% and 100% thresholds in sensitivity analyses not presented here.

Next, the urban/rural indicator from the POS was used to classify facilities by location. For the hospitals, bed size was used to create the large versus small distinction by examining the distributions of bed size after dividing the sample into urban and rural hospitals. Results were compared with the cutoffs used in the Healthcare Cost and Utilization Project (HCUP) data to establish the threshold at which to split the data. The 65th percentile (286 beds for urban, 53 beds for rural) was selected as the threshold, approximating the HCUP thresholds and

ensuring a reasonable sample size for large and small hospitals.

The analysis consisted of a visual exploration of the geographic variation in the prevalence of facility anesthesia staffing models using ZIP code-level maps. Stratifications of the staffing models were analyzed and presented by opt-out status, location (rural/urban), and facility type (large hospital, small hospital, ASC). The study was granted institutional review board exemption status as it did not involve human subjects.

## Results

Researches identified 1,920 predominantly CRNA facilities, 1,685 predominantly anesthesiologist facilities, and 2,796 team facilities (see Table 1). (Color illustrations of the anesthesia staff model by opt-out status, rural and urban

location, urban location and facility type, and rural location and facility type can be found in the Supplemental Journal Content section at [www.nursingeconomics.net](http://www.nursingeconomics.net).)

Predominantly CRNA staffing models did not appear to be more common in opt-out states than in non-opt-out states. For example, although CRNA models were prevalent in Kentucky, an opt-out state, high concentrations of predominantly CRNA facilities were also noted in non-opt-out states in the Ohio River Valley and Appalachia regions. Facilities in California, an opt-out state, tended to use the predominantly anesthesiologist model, possibly due to longstanding practice patterns.

Many opt-out states in the Midwest, East, and South (e.g., Wisconsin, Minnesota, Iowa, Nebraska, Kansas, Alabama, New Hampshire) had larger

proportions of facilities that were predominantly CRNA or team compared with facilities that were predominantly anesthesiologist. Likewise, non-opt-out states in these same regions tended to have a greater number of predominantly CRNA and team facilities (e.g., Arkansas, Florida, Michigan, North Carolina, Ohio). Interestingly, the area between Boston and Washington, DC, along the East coast was dominated by predominantly anesthesiologist facilities, similar to California. Opt-out states further West (e.g., Colorado, Washington, Oregon) tended to have increasing proportions of predominantly anesthesiologist facilities. Similarly, non-opt-out states in the West tended to have a greater number of predominantly anesthesiologist facilities (e.g., Arizona, Montana, Utah).

Examining the location of facilities by urban and rural location, it becomes evident the use of predominantly CRNA and team staffing models, regardless of state opt-out status, was largely driven by rural or urban location.

Most rural facilities used predominantly CRNA and team models. The prevalence of these models was greatest in the Southeast and Midwest. The further West a facility was located, even in rural areas, the more likely that facility was to employ a predominantly anesthesiologist model, although prevalence of the predominantly CRNA and team models was still high. In large urban areas, such

as those in California and the Northeast, regardless of state opt-out status, predominantly anesthesiologist facilities dominated. In other urban areas that were more interspersed with rural areas such as those in the Southeast and Midwest, the number of predominantly CRNA and team facilities increased relative to predominantly anesthesiologist facilities. As noted previously, the further West facilities were located, the more prevalent predominantly anesthesiologist facilities became.

Finally, in urban locations, regardless of facility type, the facilities tended to use the predominantly anesthesiologist staffing model. In the South and Southeast, there was a higher prevalence of ASCs using the predominantly CRNA staffing model. In the Eastern half of the country, large urban hospitals tended to use the predominantly anesthesiologist model, whereas small urban hospitals were more likely to use a predominantly CRNA or team staffing model. On the West coast, the predominantly anesthesiologist model was more prevalent for all types of facilities.

Regarding the stratification for facilities in rural locations, the predominantly anesthesiologist model was rarely used regardless of facility type. Many rural ASCs and small hospitals, particularly in the Midwest, used a predominantly CRNA model. Team models were the most common for large rural hospitals in the Midwest, Southeast, and Northeast.

## Discussion

CRNA utilization, whether in a predominantly CRNA or team model, is one approach to reducing the costs of anesthesia services. Several studies of the provision of anesthesia services have been conducted to examine the differences in costs and quality of care between CRNAs and anesthesiologists. Studies examining costs have shown that predominately CRNA models consistently provide cost-effective care relative to other anesthesia models (French, Guzman, Rubio, Frenzel, & Feeley, 2016; Hogan et al., 2010; Lewin Group, 2016; Liao et al., 2015). That is, they provide care of a similar or higher quality with lower total anesthesia delivery costs to groups, facilities, and health systems. Staffing is often a primary cost driver in health care, and a study of oncologic surgical procedures found that increasing the CRNA-to-anesthesiologist staffing ratio was a potentially cost-saving action (French et al., 2016). Several other studies have shown no differences between anesthesia staffing models for patient quality or safety for a variety of procedures and settings (Coron et al., 2010; Dulisse & Cromwell, 2010; Henrichs et al., 2009; Lewis, Nicholson, Smith, & Alderson, 2014; Negrusa, Hogan, Warner, Schroeder, & Pang, 2016; Pine, Holt, & Lou, 2003; Simonson, Ahern, & Hendryx, 2007).

Results of this study indicate predominantly CRNA staffing models did not appear to be

more common in opt-out states than in non-opt-out states. However, consistent with prior research (Daugherty et al., 2011; Doty et al., 2008; Fallacaro & Ruiz-Law, 2004; Greenwood & Biddle, 2015; Kozhimannil et al., 2015; Liao et al., 2015), a large variation was found in the prevalence of models involving CRNAs (predominantly CRNA and team) and CRNA models were most prevalent in rural locations. These results show that in urban locations, predominantly anesthesiologist models tended to be dominant, and in rural locations, few facilities used predominantly anesthesiologist staffing models. Thus, initiatives to decrease anesthesia costs may be most effective if targeted toward increasing use of CRNAs in urban locations.

Further, these results revealed facility type and size exhibited some correlation with anesthesia staffing models, although the distribution of anesthesia staffing models appeared to be most strongly associated with urban/rural location. Thus, although the Medicare physician supervision opt-out policy alone did not appear to be a primary driver in facilities' chosen anesthesia service delivery model, a state's opt-out status may work in conjunction with individual facility characteristics and rural/urban facility location to influence a facility's anesthesia staffing model. The Medicare opt-out policy for CRNA

physician supervision may have been effective in increasing CRNA supply and therefore access to surgical care in rural areas. However, additional longitudinal data are required to confirm these cross-sectional findings.

## Conclusion

In 2001, CMS allowed state governors to determine whether the state wished to "opt out" of physician supervision of CRNAs providing anesthesia services. In light of this regulatory change, researchers examined the prevalence of three anesthesia staffing models in the United States: predominantly anesthesiologist, predominantly CRNA, and team by state opt-out status, facility rural/urban location, and facility type. The predominantly anesthesiologist staffing model remained common, particularly in urban, Western, and Northeastern areas of the United States. CRNAs appeared to provide access to anesthesia services in areas, particularly rural locations, where these services might not have otherwise been available. Allowing CRNAs to provide anesthesia services independently may help alleviate perceived anesthesiology provider shortages, particularly in rural locations without adversely affecting patient quality of care while reducing medical expenditures. \$

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