New Estimates for CRNA Vacancies

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A national survey to estimate vacancy rates of Certified Registered Nurse Anesthetists (CRNAs) in hospitals and ambulatory surgical centers was conducted in 2007. Poisson regression methods were used to improve the precision of the estimates. A significant increase in the estimated vacancy rate was reported for hospitals relative to an earlier study from 2002, although it is important to note that there were some methodological differences between the 2 surveys explaining part of the increase.

Results from this study found the vacancy rate was higher in rural hospitals than in nonrural hospitals, and it was lower in ambulatory surgical centers. A number of simulations were run to predict the effects of relevant changes in the market for surgeries and number of CRNAs, which were compared to the predictions from the previous survey. The remarkable factor since the last survey was the unusually large rate of new CRNAs entering the market, yet the vacancy rates remain relatively high.

Keywords: Certified Registered Nurse Anesthetist, demand, labor market, vacancies, workforce.

The availability of Certified Registered Nurse Anesthetists (CRNAs) is vital to the ability of our nation's hospitals and ambulatory surgical centers (ASCs) to perform surgeries and to provide other procedures that require the delivery of anesthesia. In the midst of challenges to our healthcare system such as an aging population, a nursing shortage, increasing rates of uninsured people, and increased accountability, changes in the supply of CRNAs are examined. Just as the healthcare system faces ongoing challenges, the profession has sought to address and monitor the supply and demand of CRNAs.

This article builds on prior estimates and descriptions of supply trends of CRNAs. Data from a survey of hospitals and ambulatory surgical centers from 2007, together with information from the American Hospital Association 2006 Annual Survey, are used to estimate vacancies of CRNAs on a state level for hospitals and on a regional level for ASCs. These estimates are considered in relation to trends in the graduation and certification of new CRNAs, as well as retirement projections allowing for projections of supply trends in the future given different possible future scenarios. Finally, this article offers areas requiring attention for the future.

Methodology

• *Survey Methodology.* Survey data were collected from hospitals and ASCs across the United States from May to October 2007. Hospital and ASC administrators were provided 2 survey methods: a paper copy survey or on a web page. The survey requested information regarding: (1) the location of the hospital, (2) the number of CRNA and other anesthesia provider positions, (3) the number of vacancies of CRNAs and other anesthesia providers, (4) practice characteristics (not used in this article), and (5) impediments to providing surgeries in a timely manner or increasing the number of surgeries performed. There were 5,400 requests for surveys mailed to hospitals, and 1,022 hospitals responded for a response rate of 18.9%; 14% of the respondents used the website survey. There was significant variation in the number of responses by state with Texas having 77 responses and California, Illinois, and Kansas following with between 40 and 50 responses. There were 12 states with fewer than 10 responses.

The ASC survey was conducted from June through September 2007 with ASC administrators receiving the same response tools as the hospital administrators. The structure of the survey instrument for ASCs was very similar to that of the survey instrument for hospitals. A total of 5,033 requests for surveys were mailed to ASCs, and 711 ASCs responded for a response rate of 14.1%; 13% of the respondents used the website survey. There was significant variation in the number of responses by state with California having 72 responses and Florida, Maryland, and Texas having between 40 and 50 responses. However, 21 states had fewer than 10 responses, highlighting the need to be attentive to the low number of states reporting vacancy data for ASCs.

• *Poisson Regression Methodology.* The survey contained direct queries regarding vacancies, and some of those results are reported below. However, the precision of vacancy estimates for hospitals was significantly increased by merging hospital data from the American

Hospital Association (AHA) data set with these data. Specifically, these data, along with other AHA hospital characteristics data, were used to estimate a Poisson regression model to explain the number of vacancies for those hospitals in both data sets. Cameron and Trivedi[1] provide a thorough discussion of Poisson regression models. The explanatory variables used to explain vacancies are log (surgeries), log (average daily census), log (operating rooms), and 50 state dummy variables. All log variables are adjusted to ensure the variable is not zero. Details of the estimation procedure, construction of standard errors for reported vacancy rates, and the regression results are available at the American Association of Nurse Anesthetists (AANA).

Given the parameter estimates, vacancies at every hospital in the AHA data set, even for those hospitals not participating in the survey were predicted. Then, by aggregating vacancies over AHA hospitals in each state, an estimate of the number of CRNA vacancies by state was derived. The Poisson regression methodology is better than just reporting results directly from this survey because it provides a natural weighting scheme for incorporating vacancy data for each reporting hospital.

Unfortunately, the Poisson regression methodology procedure can not be used for ASC vacancy rates because the AHA data set does not include data on ASCs, and there is no comparable data set for ASCs. Thus, the ASC data is not as precise and, for many states, is unreliable to be reported by state. Instead, results for ASC vacancies are reported by regions allowing regional sample sizes to be large enough.

Vacancy Estimates for Hospitals

• *Estimates Using Poisson Regression.* Two meaningful ways to report vacancy rates include: vacancies per 100 CRNAs and vacancies per 1,000 surgeries. Each of the measures used is a ratio where the numerator is the number of vacancies and the critical issue is the denominator. The first ratio is a measure of the proportion of CRNA positions not being filled, while the second is a measure of the unfilled demand relative to the most common use of CRNAs. Both measures have advantages and disadvantages. The advantage of the ratio of the proportion of CRNA positions not filled is that it accounts for variations across states in the mix of CRNAs and anesthesiologists in providing anesthesia services. For example, a state with a low mix of CRNAs relative to anesthesiologists might have a small number of vacancies relative to surgeries but a large number relative to CRNAs. The former measure is more informative in this study. The advantage of the second ratio is that it potentially provides a measure of unfilled demand for anesthesia services treating CRNAs and anesthesiologists as substitutes in the provision of anesthesia services.

Figure 1 displays the variation in vacancies per 1,000 surgeries by state across the United States based on the Poisson regression results. The states with high vacancy rates are mainly in the upper Midwest and many states east of the Mississippi River. The far West is notable for having quite low rates, at least relative to the rest of the country. The states with the highest rates (in order) are Montana (0.520), Louisiana (0.450), Nebraska (0.448),

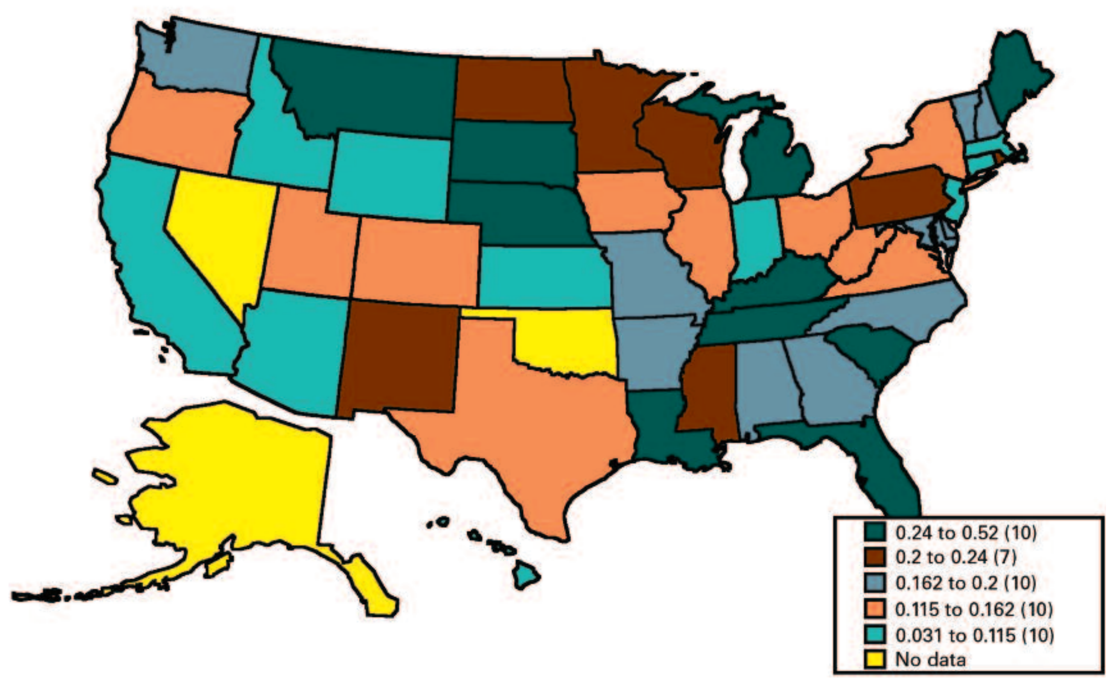

Figure 1. Vacancies Per 1,000 Surgeries Using Poisson Estimates

Michigan (0.332), South Carolina (0.322), South Dakota (0.313), and Florida (0.284), and the states with the lowest rates (in order) are Hawaii (0.031), Arizona (0.032), Wyoming (0.046), Indiana (0.057), and Massachusetts (0.069). If, instead, the alternative measure of vacancies per 100 CRNAs is used, then the states with the highest rates are Montana (60.00), Nebraska (37.04), New York (27.57), New Mexico (25.82), and Kentucky (25.35), while the states with the lowest rates are Hawaii (3.43), Kansas (4.02), Wyoming (4.35), Idaho (4.50), and Arizona (6.26). The results are displayed in the Table.

The estimates imply national vacancy rates of 0.18 vacancies per 1,000 surgeries and 14.7 vacancies per 100 CRNAs. Relative to the results reported in Merwin et al,[2] for 2002, the number of (estimated) vacancies grew from 2,674 to 5,020 ($P < 0.01$). Estimated numbers at the state level are not reliable enough to make comparisons with Merwin et al.[2] There are a number of factors that influence the large apparent increase in estimated vacancies. First, the population of hospitals included in the analysis changed. In 2002, only medical/surgical hospitals (as defined by AHA) were used, and, in 2007, all hospitals were used. Had only medical/surgical hospitals been used in the 2007 analysis, there would have been 4,586 hospitals instead of 6,007; the number of hospitals included in 2002 was 4,748. The estimated number of vacancies associated with medical/surgical hospitals is 4,596, which represent a 71.9% increase over 2002 estimated vacancies in medical/surgical hospitals.

The analysis begs 2 questions: (1) should hospitals other than medical/surgical hospitals be used? and (2) what accounts for the large increase even in medical/surgical hospitals?

With respect to the first question, other hospitals should be included. First of all, the Poisson regression results show that, once one controls for the 3 explanatory variables and state dummy variables, whether a hospital is a medical/surgical hospital is no longer predictive of the number of vacancies at the hospital ($t = -0.21$). In fact, other hospitals do have CRNA vacancies with eye, ear, nose, and throat hospitals, children's orthopedic hospitals, cancer hospitals, children's other specialty hospitals, other specialty hospitals, children's general medical and surgical hospitals, surgical hospitals, heart hospitals, and acute long-term care hospitals all reporting CRNA vacancies. The estimated number of vacancies per hospital in medical/surgical hospitals is 1.00, while, in nonmedical/surgical hospitals, it is 0.30. However, the 424 estimated CRNA vacancies at nonmedical/surgical hospitals are real.

With respect to the second question, part of the explanation for increased vacancies is a change in the wording of the survey question about CRNA vacancies. The 2002 survey counted full-time equivalent vacancies at the time of the survey, and the 2007 survey counted total vacancies (not in full-time equivalents) over the previous year. If the number of vacancies for part-time positions is translated into full-time equivalent positions by counting 2 part-time positions as 1 full-time position, then the number of vacancies in 2007 would be reduced to 4,593. Still there would be an increase of 1,920 vacancies between the 2002 and 2007 survey. In fact, the vacancy rate would have increased if the number of surgical procedures dramatically increased or there was a significant increase in CRNA retirements greater than estimated.

Another way to interpret the national numbers is to compare it to vacancy rates for the United States civilian labor force. While there is no analog for the civilian labor force to surgeries, one can directly compare the estimate of vacancies per 100 CRNAs to a US labor force analog. Zagorsky[3] reports an average (comparable) vacancy rate for the period 1960 to 1994 of 1.98 vacancies per 100 labor force participants (see Table); he uses newspaper help wanted ads, so one should be somewhat careful in making comparisons. The National Advisory Council on Nurse Education and Practice[4] report vacancy rates for registered nurse positions in hospitals for a subset of the United States, relatively similar to the rates in this study for CRNAs, while Mientka[5] reports vacancy rates 3 times higher for CRNAs than for registered nurses in the US Department of Health & Human Services, Indian Health Services, for fiscal year 2003.

• *Sources of Variation in Vacancy Rates.* A critical question for this study is what factors affect vacancy rates. One important factor considered was ruralness. Following Stern and colleagues,[6] a 3-category aggregation of a 9-level measure of ruralness, called the Rural-Urban Continuum Code, developed by the US Department of Agriculture and discussed in Butler and Beale[7]—metro (codes 1-3), nonmetro but adjacent to metro (codes 4, 6, 8), and nonmetro and not adjacent to metro (codes 5, 7, 9) were used. US regions are defined as: Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont); Southeast (Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia); Great Lakes (Illinois, Indiana, Michigan, and Wisconsin); Central (Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, and South Dakota); West (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming); Mid-Atlantic (Delaware, Maryland, Ohio, and Pennsylvania); and Gulf (Alabama, Florida, Louisiana, Mississippi, and Texas). Results are shown in Figure 2, disaggregated by the measure of ruralness and by geographic region.

Analysis of the data reveals, as one moves from metro hospitals to rural hospitals, the vacancy rate climbs in a fairly consistent way. In fact, for every US region, vacancy

State	Vacancies	Vacancies/100 CRNAs Estimate	Vacancies/100 CRNAs Standard error	Vacancies/1,000 surgeries Estimate	Vacancies/1,000 surgeries Standard error
Alabama	104.48	8.432*	5.223	0.169*	0.105
Arkansas	53.20	13.070*	8.309	0.192*	0.122
Arizona	15.72	6.264*	4.057	0.032*	0.021
California	232.01	18.605*	12.048	0.104*	0.067
Colorado	38.48	11.951*	7.582	0.118*	0.075
Connecticut	30.07	7.651	5.571	0.096	0.070
Delaware	19.26	13.859	10.795	0.198	0.154
Florida	428.49	17.758	12.702	0.284	0.203
Georgia	153.57	15.559	10.496	0.186	0.125
Hawaii	2.98	3.426*	2.231	0.031*	0.020
Idaho	11.10	4.495*	2.654	0.095*	0.056
Illinois	186.92	17.040*	9.722	0.159*	0.091
Indiana	37.75	16.203	10.611	0.057*	0.037
Iowa	51.54	18.473*	11.431	0.117*	0.072
Kansas	21.97	4.023*	2.249	0.075*	0.042
Kentucky	155.67	25.353*	16.078	0.272*	0.173
Louisiana	256.05	24.201*	13.208	0.450*	0.246
Maine	47.88	21.470*	13.317	0.277*	0.172
Massachusetts	50.62	8.975	6.334	0.069	0.048
Maryland	95.90	19.611	14.139	0.169	0.122
Michigan	375.68	21.418	15.054	0.332	0.233
Minnesota	100.24	7.311*	4.581	0.203*	0.127
Mississippi	71.93	15.047*	9.720	0.234*	0.151
Missouri	127.44	13.557	9.062	0.198	0.132
Montana	43.80	59.996*	35.867	0.520*	0.311
North Carolina	153.52	7.777	8.353	0.173	0.186
North Dakota	15.68	8.338*	4.949	0.200*	0.119
Nebraska	97.42	37.041*	22.628	0.448*	0.274
New Hampshire	22.17	12.965*	8.336	0.181*	0.116
New Jersey	61.39	10.621	7.369	0.087	0.060
New Mexico	33.57	25.824*	14.827	0.218*	0.125
New York	264.99	27.574*	17.944	0.127*	0.083
Ohio	196.06	12.013	8.364	0.158	0.110
Oregon	38.27	15.007*	9.389	0.115*	0.072
Pennsylvania	340.83	13.069	9.159	0.215	0.151
Rhode Island	31.64	20.027	14.428	0.237	0.171
South Carolina	157.09	18.395*	11.453	0.322*	0.200
South Dakota	35.63	12.955*	7.773	0.313*	0.188
Tennessee	159.80	10.458	7.073	0.240	0.162
Texas	292.66	12.286*	8.026	0.144*	0.094
Utah	30.05	18.210*	10.826	0.133*	0.079
Virginia	110.10	11.601	8.305	0.149	0.106
Vermont	10.45	18.659	12.190	0.162	0.106
Washington	74.09	16.877	10.467	0.169*	0.105
Wisconsin	134.12	22.095	12.701	0.200*	0.115
West Virginia	45.85	10.397	6.915	0.149	0.099
Wyoming	2.00	4.346	2.543	0.046	0.027

Table. Vacancy Estimates Using Robust Poisson Standard Errors

Alaska, Nevada, and Oklahoma are not reflected due to either no response rate or no vacancy.

* Statistically significantly different from 0 at the 10% level.

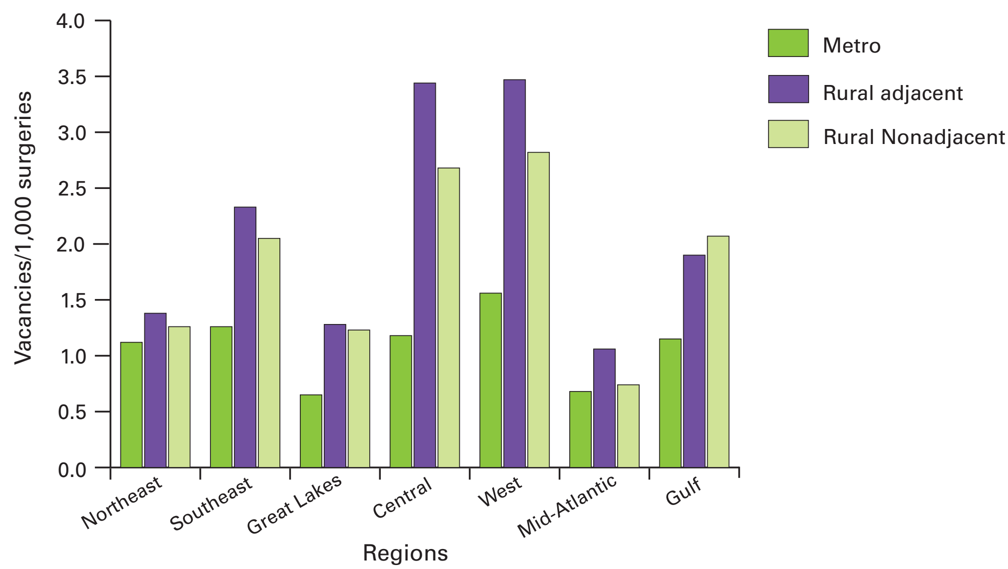

Figure 2. Vacancies Per 1,000 Surgeries Disaggregated by Ruralness

rates are lowest in the metro (urban) areas. However, maybe surprisingly, vacancy rates are more often higher in rural adjacent to metro area counties than in rural non-adjacent to metro area counties.

• *Effects of Vacancies on Surgeries.* Hospital administrators were asked 2 survey questions about impediments to performing more surgeries: (1) If you wanted or needed to perform more surgeries in the near future, would you need more surgical providers, operating rooms, procedure rooms, anesthesiologists, CRNAs, critical care nurses, operating room nurses, postoperative nurses, other, or no additional resources would be needed?, and (2) From among the following: surgical providers, operating rooms, procedure rooms, anesthesiologists, CRNAs, critical care nurses, and other, what was the most prevalent reason in 2006 for delaying or not scheduling a surgical procedure (or alternatively there were no delays)? Among respondents who answered the first question, 46.5% said that, in order to perform more surgeries, the hospital would need more CRNAs. The only response more commonly chosen was the need for more operating room nurses at 50.1%. Among those who answered the second question, 12.2% cited CRNA problems, but no delay (35.1%); surgical providers (22.8%) and operating rooms (16.6%) were more common answers. Thus, it appears that hospitals would hire more CRNAs but have found ways to organize anesthesia provision so that it is infrequently a source of surgical delay.

Vacancy Estimates for Ambulatory Surgical Centers

Unlike the case for hospitals, the vacancy estimates for ASCs can not be improved by using a national data set like the AHA hospital data set as an additional data source because one is not available. The lack of a data set such as AHA, for ASCs, limits one's ability to estimate vacancy rates at a state level. Therefore, the sample size is effectively smaller and estimates do not reflect proper weighting to account for variations in the number and characteristics of ASCs across states. The small state-specific sample sizes do not allow reporting of state-specific vacancy rates with any precision and could lead to confidentiality issues. Therefore, for ASCs, regional vacancy rates are reported.

Figure 3 displays vacancy rates for each region using both vacancies per CRNA and vacancies per 1,000 surgeries. Note that the denominator is changed from 100 CRNAs to 1 CRNA in order to include both rates on 1 chart. One should note that, for the most part, both measures rank regions in the same order in terms of rates. This suggests that, in this region, CRNAs play an important role in anesthesia provision. Comparing Figure 1 to Figure 3, those regions with high hospital vacancy rates are quite different than those with high ASC vacancy rates. Further data and analysis of this information are important to describe the cause of these deviations.

One can estimate the quantity of CRNA vacancies in ASCs using available data by estimating CRNAs per operating room from the ASC survey, estimating the number of ASC operating rooms by region using a master list of ASCs by state, and then multiplying the 2 estimates. The results of this exercise are reported in Figure 4. One sees that the regions with the most estimated vacancies are the Gulf Region and the West. The total number of estimated vacancies at ASCs is 1,196. Overall, the estimated vacancies per 100 CRNAs in ASCs is 11.1,

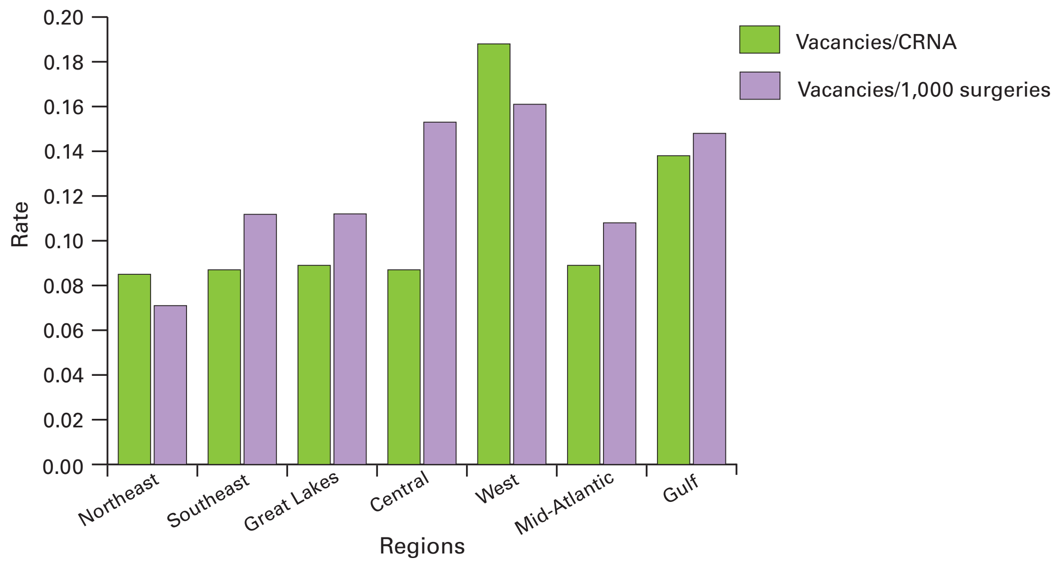

Figure 3. Ambulatory Surgery Center Vacancies Per CRNA and Per 1,000 Surgeries

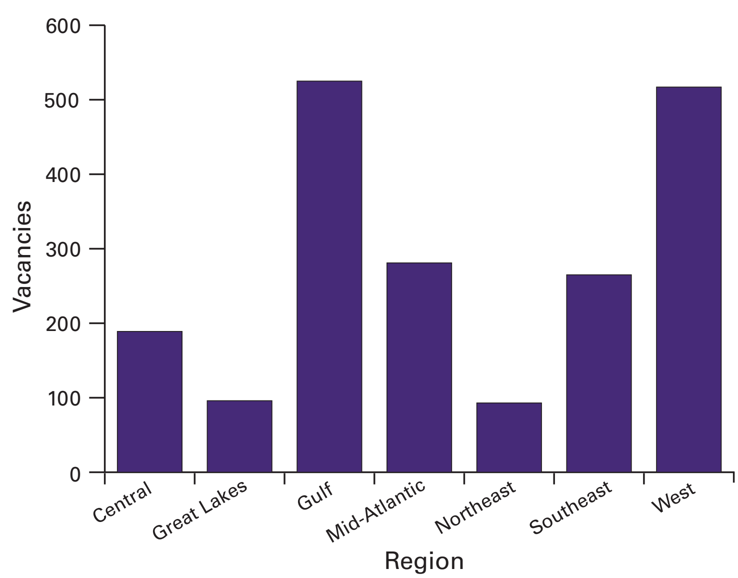

Figure 4. Estimated Ambulatory Surgery Center Vacancies by Region

and the estimated vacancies per 1,000 surgeries is 0.13. These compare to the results for hospitals reported in the section on Estimates using Poisson Regression of 14.7 and 0.18 respectively. Thus, vacancy rates in ASCs are significantly lower than in hospitals. Some factors that may contribute to a lower CRNA vacancy rate in ASCs include variables such as no required call schedule, no holiday work commitment, less complicated patients, less complicated surgical procedures, and typically regular work hours (6 AM to 6 PM).

• *Effects on Surgical Provision.* ASC administrators were asked the same 2 questions about impediments to surgery provision described in the section on Effects of Vacancies on Surgeries. Of those who responded, 34% said they would need more CRNAs to perform more surgeries. However, unlike the case for hospitals, most of the other inputs to surgery provision were needed as much as CRNAs. The standard theory of firm behavior suggests that the firm (in this case, a hospital or ASC) should need to increase all inputs in order to increase output; other-

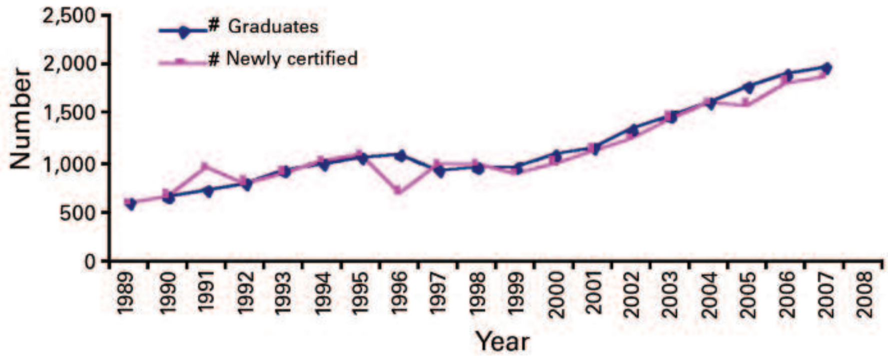

Figure 5. Growth in Graduates and Newly Certified CRNAs, 1989-2007
Source: Council on Certification of Nurse Anesthetists. Unpublished data. Park Ridge, IL. February 2, 2007.

wise the firm has unutilized capacity. The results suggest that ASCs are more efficiently managed than hospitals. More evidence in support of this statement is that, with respect to the second question about impediments, 50% of respondents state that "there are no delays," while no suggested cause of delays is reported as relevant by more than 15% of respondents.

Predictions for the Future

• *Training Rate for New CRNAs.* To a great degree, the vacancy rate is a function of the supply of CRNAs. In turn, the supply of CRNAs changes over time as new CRNAs are trained and older CRNAs retire. In this section, methodology similar to Merwin et al[8] to estimate the rate of growth of demand for surgeries, data on retirement from Merwin et al[8] to predict future retirement patterns, and more recent data on newly certified nurse anesthetists to predict future entry is implemented. As can be seen in Figure 5, over the last decade, there has been a significant increase in the number of CRNAs who are being trained. The growth rate in demand for surgeries is estimated at 0.8% per year.

• *Projections for the Future.* For the remainder of this analysis, 4 different scenarios are considered to show how the ratio of CRNAs to 1,000 surgeries will change over the next few years. The measure of CRNAs to 1,000 surgeries (rather than vacancy rates) is used because it aids in comparison with previous work in Merwin et al,[8] and the literature is silent on how to convert supply of and demand for CRNAs into vacancy rates. Zagorsky[3] discusses the predictive power of vacancies for business cycles, and Pissarides[9] provides an economic model with vacancies playing a natural role in equilibrium labor markets. In any case, if the ratio of CRNAs to surgeries increases, vacancies will decline and the market will become more of a "buyers' market." This implies fewer delays in providing surgeries, lower wage growth, and more unemployment.

Scenario 1: Impact on the ratio of CRNAs to surgeries if 1,995 newly certified nurse anesthetists are added to existing CRNAs each year from 2007 to 2021. The choice of 1,995 newly certified nurse anesthetists follows from the height of the "new graduates" curve in Figure 5. Thus, the assumption in this case is that future training rates will remain constant relative to 2006.

Scenario 2: Impact on the ratio of CRNAs to surgeries if 1,995 newly certified nurse anesthetists are added to existing CRNAs in 2007 and an increase in newly certified nurse anesthetists of 130 per year occurs in subsequent years. The choice of an increase of 130 per year uses the slope of the "new graduate" curve in Figure 5 between 1998 and 2006. Thus, the assumption in this case is that the future growth rate of training programs will remain constant relative to the period, 1998-2006.

Scenario 3: Impact on the ratio of CRNAs to surgeries if surgery demand grows twice as fast as estimated.

Scenario 4: Impact on the ratio of CRNAs to surgeries if the number of newly certified nurse anesthetists is cut in half. This might occur, for example, if the shortage of faculty discussed in Merwin et al[10] is severe enough.

The simulated effects of the different scenarios on the ratio of CRNAs to surgeries are shown in Figure 6. The baseline scenario is the first one. In this case, the ratio starts at 1.24 in 2007 and grows to 1.50 by 2020. Comparing baseline projections with a ratio of 1.02 in 2000 and predicted growth to a ratio of 1.12 by 2007, means these ratios were underpredicted.[8] This is because, in the intervening years, growth of newly certified nurse anesthetists far outpaced previous growth rates. Another increase, from 1.24 to 1.50, seems quite large and may cause higher unemployment rates, lower wage growth, less attractive working conditions for practicing CRNAs, fewer high-quality applicants to CRNA training programs, and lead to other changes consistent with a weaker labor market for CRNAs. There will probably be significant variation in the magnitude of these changes

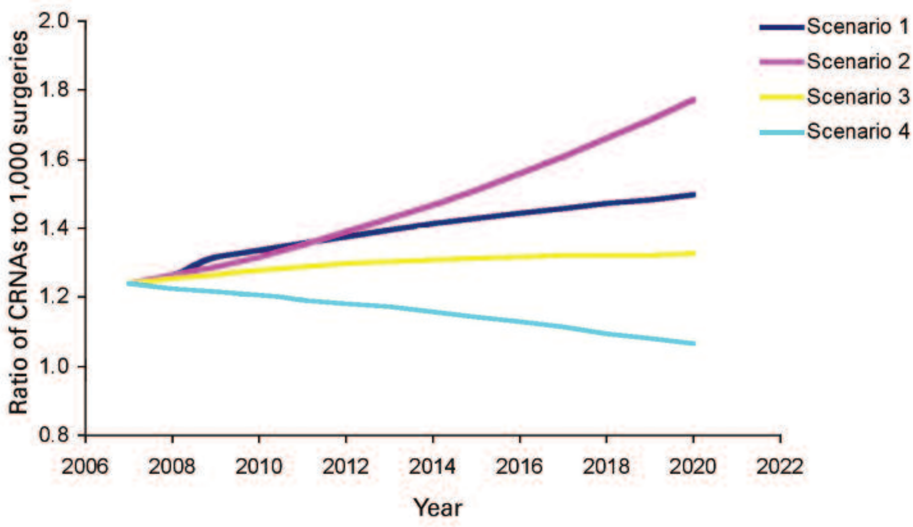

Figure 6. Effect of Different Scenarios on Ratio of CRNAs to 1,000 Surgeries

across regional markets. But, overall, the labor market for CRNAs will probably become less attractive for practicing and potential CRNAs.

If, instead, as seen in scenario 2, the growth in training programs continues at its current pace, then the ratio is predicted to increase from 1.24 to 1.77. One might hope that increases in demand for surgery would reduce the ratio. However, as seen in scenario 3, a doubling of the rate of growth in demand for surgeries would still lead to a modest increase in the ratio from 1.24 to 1.33. Only a very large reduction in the rate of training new CRNAs, as seen in scenario 4, will bring the ratio back to near its 2000 level.

In contrast, as illustrated in Figure 1 and Figure 2, while there are some surgical facilities with relatively low vacancy rates, there are others, especially in the upper Midwest and in rural areas with high vacancy rates. When assessing these findings, a reader may infer that the "best of both worlds" might be attained if CRNAs moved to the areas of shortage. In particular, vacancy rates can decline in high vacancy rate areas leading to better delivery of anesthesia services, and supply relative to demand for CRNAs in areas with lower vacancy rates can remain relatively constant. To some degree, this movement will occur naturally as the labor market for CRNAs tightens in low vacancy areas. However, added incentives offered by surgical facilities in high vacancy areas may be a strategy to encourage CRNAs to relocate.

Conclusions

This study offered an update from the supply and demand study previously conducted. The findings of this study indicate that the number of hospital vacancies has increased significantly, though some of the increase is due to changes in survey methodology. (Note that the analysis is limited to those states where an estimate could be constructed.) The value of monitoring vacancies is to better project demand for CRNAs in the future. Findings from this study indicate the continued demand for CRNAs is likely. The imbalance of CRNA vacancy rates in rural and urban areas offers great disparity. A factor that may contribute to the increase in hospital vacancy rates is the lifestyle balance offered in other settings such as ASCs, pain clinics, and office-based settings. The work hours and patient complexity in settings outside of the hospital are typically less intense and therefore more conducive to a work/life balance for many CRNAs. Findings in this study indicate an increase in the number of vacancies in hospitals.

The need for CRNAs is often higher in the rural adjacent to metro area counties than in the rural nonadjacent areas. A more evenly distributed CRNA population throughout the United States would provide a more unified distribution of vacancies and possibly more even provision of anesthesia services.

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