

US Survey of Incidence of and Reasons for Nurse Anesthetists Leaving or Having Considered Leaving Their Jobs

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Many nurse anesthetists changing positions or considering leaving their positions can give the impression that suboptimal quality of anesthesia department leadership exists. To provide nationally accurate benchmark data on annual turnovers of nurse anesthetists to assist chief nurse anesthetists who may be scrutinized for the resignation rate of nurse anesthetists at their hospital, we used the 2018 US National Sample Survey of Registered Nurses. Analyses show that, during 2017, approximately 13.6% (99% CI, 6.6%-25.8%) of survey respondents left the positions that they held as of December 31, 2016. Approximately 37.6% considered leaving but did not resign as of December 31, 2017 (CI, 26.2%-50.6%). Estimates for nurse anesthetists were comparable to those for registered nurses

(ie, not unique to nurse anesthetists). With both estimates combined, approximately 53% of nurse anesthetists changed or considered leaving their primary position (CI, 37.3%-68.0%, $P=.62$ compared with half). The most commonly reported reason was "better pay/benefits" ($P\leq.0064$ vs all other reasons, including burnout). Applying the results, in a department with 37 nurse anesthetists, the national incidence of 13.6% would represent a turnover of 5.0 per year. The 13.6% incidence could also result in 1 of 5 years having as many as 11 nurse anesthetists (30%) leaving.

Keywords: Anesthesiology, NSSRN, nurse anesthetists, personnel turnover, salaries and fringe benefits, surveys and questionnaires.

Chief Certified Registered Nurse Anesthetists ("nurse anesthetists")^a have management responsibility for the work under their direction. A high annual rate of leaving the practice may be interpreted by hospital management as revealing poor leadership. In addition, hospitals sometimes survey employees to learn if they considered leaving during the previous year. This metric sometimes is used to assess the quality of departmental leadership. The objective of our study was to analyze publicly available, nationally representative, benchmark data on annual turnover of nurse anesthetists to assist a chief nurse anesthetist under scrutiny about what is believed to be a low level of employee retention.

The 2018 National Sample Survey of Registered Nurses (NSSRN) was performed by the National Center for Health Workforce Analysis and the US Census Bureau.^{1-3,a} We used the downloadable data to obtain the national annual incidence of nurse anesthetists changing positions or considering leaving their positions, and the primary reasons for such changes.⁴

Methods

This study was performed with the 2018 NSSRN public use data files and documentation downloaded from the US Health Resources & Services Administration's Nursing Workforce Survey Data site.¹ Methodologic descriptions, including definition of terms, were provided in their technical documentation.² The following block quotations come from the referenced documentation for using the public use data files.^{2,3}

The 2018 NSSRN utilized a sampling frame of registered nurses built from a list compiled from the National Council of State Boards of Nursing and from individual State Boards of Nursing. Sampling was done independently within each of the 50 states and the District of Columbia. There were 2 sampling strata per state: one for nurses that hold a nurse practitioner license and another for all other registered nurses.²

Data collection for the 2018 NSSRN began on April 30, 2018 and extended to October 12, 2018. Survey invitations were mailed to potential respondents that gave them the opportunity to participate via a web

^a Throughout our article, we use multiple quotations for precision. We used the NSSRN's definition of nurse anesthetist, which means completed anesthesia training and was "actively licensed to practice as a registered nurse in the US" "as of December 31, 2017." Among the 730 respondents contributing to our primary question (Table 1), from which national estimates for 37,227 were obtained, all but 1 had current national certification on that date. The survey, and our study, then asks about change in position (ie, job) during the preceding year.

| Survey question | Nurse anesthetists, ^a national % (99% CI) | Other advanced practice nurses, ^{b,c} national % (99% CI) | Other registered nurses, ^{c,d} national % (99% CI) |
|----------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------|
| Position held on December 31, 2016, differed from that held on December 31, 2017 | 13.6 ^e (6.6-25.8) | 17.9 ^e (15.8-20.2) | 18.7 (17.5-20.0) |
| Relative risk nurse anesthetists compared with other 2 groups | | 0.76 (0.36-1.59), <i>P</i> =.33 | 0.73 (0.35-1.49), <i>P</i> =.24 |
| Considered leaving position? ^f | 37.6 ^e (26.2-50.6) | 47.9 ^e (45.0-50.9) | 49.9 (48.4-51.5) |
| Relative risk nurse anesthetists compared with other 2 groups | | 0.78 (0.56-1.10), <i>P</i> =.062 | 0.75 (0.54-1.06), <i>P</i> =.030 |

Table 1. National Incidence and 99% Confidence Intervals for Nurse Anesthetists Having Left or Considered Leaving Their Positions

^a On December 31, 2017, active national certification as nurse anesthetist and/or active certification as a nurse anesthetist. The National Sample Survey of Registered Nurses asks both ways.

^b On December 31, 2017, clinical nurse specialist, nurse practitioner, or nurse midwife.

^c On December 31, 2017, actively licensed to practice as a registered nurse (RN) in the United States but not an advanced practice nurse (ie, in either of the 2 preceding columns).

^d We used in our table the categories of nurse anesthetists, other advanced practice nurses, and other registered nurses, which are categories in the National Sample Survey. These categories should be thought of as univariate predictors, not necessarily causal variables for our findings. For example, comparing self-estimated hours of clinical care per week, in their positions held December 31, 2017, nurse anesthetists' mean of 32.5 hours (99% CI, 30.39-34.6 hours) was 9.28 hours (99% CI, 7.58-10.99 hours) greater than for other advanced practice nurses (*P*<.0001) and 12.68 hours (99% CI, 11.09-14.26 hours) greater than for other registered nurses (*P*<.0001). The mean hours scheduled in a typical week was 38.19 hours (99% CI, 36.88-39.50 hours) for the nurse anesthetists, 3.13 hours (99% CI, 1.98-4.29 hours) greater than for the other advanced practice nurses (*P*<.0001) and 3.31 hours (99% CI, 2.31-4.31 hours) greater than for the other registered nurses (*P*<.0001).

^e The CIs for nurse anesthetists are wide because sampling was done based on achieving an adequate sample of registered nurses and advanced practice nurses, not nurse anesthetists (see Discussion). Using data from all advanced practice nurses (ie, the first 2 columns of numbers combined), the incidence of leaving the position held on December 31, 2016, was 17.5% (99% CI, 15.5%-19.6%). The percentage considering leaving the position held on December 31, 2017, was 46.9% (99% CI, 43.9%-49.9%).

^f Three questions were combined. Respondents answering yes to the question in the first row were skipped by the survey. They do not contribute numerator or denominator to this row. Next, "Have you ever considered leaving the primary nursing position you held on December 31, 2017?" If the answer was no, that was treated as no for this question in the third row. The third question was skipped. Otherwise, the third question was asked. "Have you considered leaving this position in the past year?" If the answer was no, that was treated as no for this row. If the respondent answered yes, then yes was considered the response for this third row.

instrument or a paper questionnaire... Potential respondents were sent up to eight invitations and reminders...

A total of 50,273 questionnaires were completed.³

The specific questions of interest in the survey were about leaving one's job.

How would you describe the primary nursing position you held on December 31, 2016? Same position and same employer as primary nursing position on December 31, 2017?³

Have you left the primary nursing position you held on December 31, 2017? Which of the following reasons contributed to your decision to leave the primary nursing position you held on December 31, 2017? Mark all that apply.

Have you ever considered leaving the primary nursing position you held on December 31, 2017? Have you considered leaving this position in the past year? Which of the following reasons would contribute

to your decision to leave your primary nursing position? Mark all that apply.

We used in Table 1 some of the questions about work hours. Next, we will ask for information about how much you worked in a typical week for the primary nursing position you held on December 31, 2017. Include on-call hours except on-call hours that were standby only. a. Number of hours scheduled in a typical week. b. Number of hours worked in a typical week.... For the primary nursing position you held on December 31, 2017, please estimate the percentage of your time spent in the following activities during a typical work-week. a. Patient care and charting.

The data downloaded were in the Stata file format (Stata 16.1, StataCorp LLC).

Weighted estimates from the NSSRN data generalize to ... national registered nurse and nurse practitioner populations.³ The 2018 NSSRN uses replicate weights to capture the effect of the sampling design on vari-

| Employment setting of nurse anesthetists | Left position held December 31, 2016, national % (99% CI) RR (99% CI), P value | Considered but did not leave position held December 31, 2017, ^a national % (99% CI) RR (99% CI), P value |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| “Critical access hospital” ^b | 12.3 (3.5-35.0) 1.03 (0.19-5.67) P=.96 | 41.4 (18.9-68.1) 1.22 (0.41-3.58) P=.48 |
| “Inpatient unit, not critical access hospital” (ie, hospital operating rooms) | 17.2 (3.8-52.2) 1.45 (0.26-7.93) P=.57 | 38.8 (11.2-76.1) 1.10 (0.28-4.32) P=.85 |
| “Hospital sponsored ambulatory care ... (surgery)” | 12.5 (3.6-35.5) 1.05 (0.22-5.07) P=.93 | 41.9 (22.5-64.2) 1.35 (0.57-3.22) P=.36 |
| Other responses (eg, “free standing” or “ambulatory surgery center”) | 11.9 (4.7-26.9) | 29.6 (12.4-55.6) |
| Census region of employment ⁸ | | |
| Northeast region | 16.6 (4.5-45.4) 2.20 (0.14-34.4) P=.45 | 38.5 (18.0-64.1) 0.66 (0.17-2.61) P=.48 |
| Midwest region | 17.6 (1.8-70.8) 2.34 (0.08-69.3) P=.51 | 36.8 (15.8-64.4) 0.63 (0.13-3.16) P=.46 |
| South region | 12.9 (6.6-23.8) 1.72 (0.16-18.9) P=.55 | 30.9 (18.0-47.6) 0.53 (0.14-1.95) P=.20 |
| West region | 7.5 (1.0-40.1) | 58.4 (10.4-94.5) |

Table 2. National Incidence of Nurse Anesthetists Having Left or Considered Leaving Their Positions Held December 31, 2016 (2nd column), or 2017 (3rd column)

Abbreviation: RR, relative risk.

^a Three questions were combined. Respondents answering yes to the question in the first row were skipped by the survey. They do not contribute numerator or denominator to this row. Next, “Have you ever considered leaving the primary nursing position you held on December 31, 2017?” If the answer was no, that was treated as no for this question in the third row. The third question was skipped. Otherwise, the third question was asked. “Have you considered leaving this position in the past year?” If the answer was no, that was treated as no for this row. If the respondent answered yes, then yes was considered the response for this third row.

^b *Critical access hospital* was defined for the respondent as “a rural community hospital that receives cost-based reimbursement from Medicare.”

ances.... [Each of the 50,273 records is provided along with 100] replicate weights for subsamples, which are used in the calculation of variances.... [The] jackknife replication method is used for estimating variances from the NSSRN.²

For all calculations in this article, we used Stata’s built-in procedures for 100 jackknife replications, each with the provided replicate weights for each observation (ie, respondent).^{2,5} Explanations based on observed counts are limited to footnotes and figure legends.^a Every sentence in the Results and in the Tables are national estimates obtained from the differential weighting of the observations.

Relative risks were estimated using generalized linear modeling with a log link function and using Poisson

distributions.^{6,7} When comparisons were made among categories (eg, 3 types of nurses in Table 1), estimates were calculated simultaneously with nurse anesthetists as the reference. For all statements in the Results, $P < .01$ was treated as significant, and 99% CIs were calculated. These more stringent criteria (ie, not $P < .05$ and 95% CIs) were applied because we made multiple comparisons.

Results

In 2017, approximately 13.6% (99% CI, 6.6%-25.8%) of nurse anesthetists left the positions that they held as of December 31, 2016. Approximately 37.6% considered leaving but did not resign their position as of December 31, 2017 (99% CI, 26.2%-50.6%). Combining those who left and those who considered leaving, without double

counting, approximately half the nurse anesthetists in the United States either changed or considered leaving their primary position (53.0%; 99% CI, 37.3%-68.0%, $P=.62$ compared with half). Estimates were not significantly heterogeneous among the types of surgical suites or regions of the county (Table 2).⁸ Estimates, in general, were comparable to those for registered nurses (ie, not specific to nurse anesthetists; see Table 1).

Applying the results, for a department with 37 nurse anesthetists, 5.0 nurse anesthetists leaving per year would be 13.6%. Using the binomial test with $\alpha=0.01$, a department should expect that every few years (eg, 1 of the 5 years of a departmental review), as many as 11 nurse anesthetists (30%) may leave.⁹

Among reasons contributing to or that would contribute to the respondent's decision to leave the position he or she held on December 31, 2017, the most commonly reported reason was "better pay/benefits" (Table 3, $P\leq.0064$ compared with all other reasons including burnout).¹⁰⁻¹³ However, the nurse anesthetists leaving their position held as of December 31, 2016, averaged 2.50 "primary" reasons other than pay/benefits (99% CI, 1.22-3.79). Among the nurse anesthetists considering leaving their position as of December 31, 2017, but who did not resign that position in 2017, 96.5% (99% CI, 84.4%-99.3%) had reasons in addition to better pay/benefits (eg, burnout) that contributed to their consideration of leaving (mean, 3.70; 99% CI, 2.46-4.94).

Discussion

Our national results show that 15% of nurse anesthetists leaving a department annually is typical. In addition, if internal surveys are performed inquiring about the employed nurse anesthetists' job plans, approximately half the organization's nurse anesthetists having left in the previous year or considering leaving is consistent with the national benchmark. Such findings should not be interpreted as indicating poor management with respect to retention of nurse anesthetists but rather as corresponding with the US national average.

One important feature of our study is that it provides national data about leaving one's job, compared with abandoning one's career. The latter topic has been surveyed among Taiwanese anesthesiologists, Finnish anesthesiologists, Swedish nurse anesthetists, and US registered nurses of all types pooled.¹⁴⁻¹⁷ The endpoints are different; advanced practice nurses (ie, including some nurse anesthetists) less often make a career change or leave the labor force fully vs other registered nurses (both $P<.001$).¹⁷

Previously, 36 of the 46 chief anesthesiologists at Veterans Affairs (VA) hospitals who were surveyed by the Government Accounting Office rated pay as the most important influence of nurse anesthetist retention.¹⁸ Our findings match those results (see Table 3). In addition,

the 2007 report included that the VA hospitals' annual rate of nurse anesthetists leaving jobs ranged from a low of 10.02% to a high of 15.6%.¹⁸ That range includes our best estimate of leaving one's job as 13.6%. This concordance suggests stability over time of our findings. Also, we think that the comparison shows the potential usefulness of our work. Interpretation of the "attrition rate" of VA¹⁸ nurse anesthetists could be different if one knows that it is comparable to the national incidence, not reflecting a situation unique to the VA hospitals.

Previously, Meeusen et al¹⁹ analyzed survey responses of 882 Dutch nurse anesthetists. There were 42% intending to leave their job within 2 years.¹⁹ Our estimate of 37.6% was slightly less, as expected because we estimated for 1 year, not 2. (Using the adjusted Wald test, the result from the US National Survey Sample data does not differ significantly from 42%, $P=.35$). The implication is that our results may be generalizable to nurse anesthetists in other countries, and reasonably likely to be stable over at least a decade.

Meeusen et al¹⁹ also studied burnout among surveyed Danish nurse anesthetists. Burnout was associated with the intention to leave one's position within 2 years ($P<.001$).¹⁹ Mahoney et al²⁰ found the same association for US nurse anesthetists. We found that burnout was the second most commonly reported reason for intention to leave positions (see Table 3), just behind better pay and benefits. Both Meeusen et al¹⁹ and Mahoney et al²⁰ found that low job satisfaction has as large an effect on intention to resign as does burnout, and they showed that the effect of job satisfaction is independent of the effect of burnout. A prediction from both their findings^{19,20} is that burnout alone should be insufficient to predict substantial job turnover, and that is what we found. From Table 3, footnote d, every nurse anesthetist considering leaving their job listed at least one primary reason in addition to or other than burnout as contributing to the decision, with a mean of 4.02 additional reasons (99% CI, 2.71-5.32). Thus, organizations should not expect that even successful reductions in the incidence of burnout will result in statistically significant increases in retention of nurse anesthetists. That should not dissuade organizations from reducing burnout; rather, they should recognize that doing so with the expectation of a payback by increasing retention is not supported by the national data. Professional burnout among nurse anesthetists is highly associated with incivility, often from physicians at the hospital.²¹ Incivility can be measured with daily or weekly evaluations.²²⁻²⁴ Providing individual civility scores to the physicians has been shown to change their behavior.^{25,26}

Our study's use has an analogy in terms of applications to a previous study of nurse anesthetists' daily unscheduled absences (eg, due to acute gastroenteritis).⁹ Table 1 shows substantial potential for misjudgment of a chief nurse anesthetist as having many nurse anes-

| Reason (descending sequence of sums of 2 columns' estimated percentages ^a) | "Reason contributed to your decision to leave"; ^b national % (99% CI) | "Reason would contribute to your decision to leave"; ^c national % (99% CI) |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Better pay/benefits ^a | 3.58 (1.10-11.00) | 20.09 (11.92-31.84) |
| Burnout ^d | 2.60 (0.76-8.47) | 11.51 (6.40-19.82) |
| Lack of good management or leadership | 2.71 (0.71-9.83) | 10.34 (5.69-18.06) |
| Inability to practice to the full extent of my license | 0.72 (0.09-5.65) | 11.77 (5.60-23.06) |
| Retirement | 1.62 (0.29-8.37) | 10.02 (3.55-25.21) |
| Scheduling/inconvenient hours/too many hours/too few hours | 3.74 (1.07-12.28) | 7.03 (3.56-13.42) |
| Interpersonal differences with colleagues or supervisors | 0.73 (0.15-3.42) | 9.98 (4.78-19.69) |
| Stressful work environment | 3.45 (0.93-11.92) | 7.19 (3.72-13.45) |
| Career advancement/promotion | 2.66 (0.63-10.60) | 7.63 (3.57-15.56) |
| Inadequate staffing | 0.34 (0.01-1.50) | 9.92 (5.31-17.76) |
| Relocation to different geographic area | 0.81 (0.26-2.52) | 6.86 (2.95-15.13) |
| Lack of advancement opportunities | 0.63 (0.06-6.51) | 6.81 (3.16-14.09) |
| Career change | 1.75 (0.06-33.11) | 3.93 (1.40-10.52) |
| Physical demands of job | 1.77 (0.34-8.73) | 3.46 (1.34-8.62) |
| Family caregiving | 0.59 (0.05-6.51) | 4.62 (1.60-12.61) |
| Lack of collaboration/communication between health care professionals | 1.78 (0.26-11.17) | 3.15 (1.22-7.92) |
| Length of commute | 0.48 (0.18-1.27) | 4.02 (1.59-9.81) |
| Sign-on bonus offered | - | 4.39 (1.69-10.88) |
| Change in child's school | - | 2.62 (0.5-12.64) |
| Spouse's employment opportunities | - | 2.55 (0.56-10.90) |
| Patient population | 0.19 (0.03-1.23) | 2.05 (0.68-6.06) |
| School/educational program | 1.84 (0.08-31.26) | 0.02 (0.0-0.12) |
| Disability/illness | 0.89 (0.13-5.73) | 0.95 (0.27-3.24) |
| Laid off/downsizing of staff | 0.64 (0.07-5.40) | - |

Table 3. Percentages of Nurse Anesthetists in the United States Having Left or Considered Leaving Their Primary Positions Held on December 31, 2016, or 2017 and Reasons for Decision

^aPairwise assessment using the Wald test, set up analogous to the McNemar test,¹³ was made between "Better pay/benefits," in either column, vs the next row, "Burnout," also in either column. "Better pay/benefits" was more common, $P=.0064$. The same conclusion applies to "Better pay/benefits" vs all other rows (ie, all $P \leq .0064$).

^bThe numerator for each percentage was the weighted number of respondents who left the position held on December 31, 2016, and selected the reason as the primary reason for the employment change. The denominator equaled the number of nurse anesthetists nationally on that date.

^cThe numerator for each percentage was the weighted number of respondents who has "ever considered leaving the primary nursing position you held on December 31, 2017," "considered leaving this position in the past year," and selected the reason as "contributing to your decision to leave." The denominator equaled the weighted number of nurse anesthetists nationally on December 31, 2017. The denominator equaled the number of nurse anesthetists nationally on that date.

^dBurnout is associated with intent to change jobs among physicians¹⁰⁻¹² and Danish nurse anesthetists,¹⁹ as found here for US nurse anesthetists. However, among the 251 nurse anesthetists contributing responses to achieve the listed national estimates, 100% listed at least one reason in addition to or other than burnout that contributed to the decision. The mean number of additional reasons provided was 4.02 (99% CI, 2.71-5.32).

thetists leaving in any one year or considering leaving. Analogously, from counting unscheduled absences of individual nurse anesthetists, there is a substantial potential to conclude falsely or unreliably that certain individuals tend to be absent on Mondays, Fridays, or days contiguous with holidays.⁹ Attempts should not be made to draw conclusions from probabilistic events

without knowing benchmark data and then applying corresponding statistical modeling.⁹

One limitation of our study is that the NSSRN structure changed substantively in 2018, combining the study of nurse practitioners and registered nurses.³ In addition, the surveys are performed infrequently, with the 2 most recent in 2012 and 2008.¹ Furthermore, this is a probabil-

ity sample. Among all nurse anesthetists in the US, only 2.0% were studied.^a (Among all other registered nurses, the sample was 1.3%). An advantage of the NSSRN design is that the survey is not anonymous, just confidential; it is administered by the Census Bureau. That is how national estimates are obtained from each respondent. However, the 2018 NSSRN was designed to have enough registered nurses and nurse practitioners to obtain meaningfully narrow CIs for those 2 populations.³ The sample was not designed based on achieving a sufficient sample of nurse anesthetists to achieve narrow CIs of our estimates. The substantial widths of our CIs are such that our findings are unlikely to be useful to readers wanting to know if their individual practice has turnover greater or less than the national average, as data for most practices will fall within the CI. Nevertheless, our results may be useful when a chief nurse anesthetist is criticized as demonstrating poor leadership because there is a year during which 20% of the nurse anesthetists resigned. Other than for organizations with hundreds of nurse anesthetists, such an incidence would still be fully consistent with the national incidence and random variation.

Another limitation is that our results apply to nurse anesthetists leaving a current position, not to the recruitment of nurse anesthetists, even though generally when a nurse anesthetist leaves a position, the chief anesthetist then needs to recruit a replacement. This is evident from Table 3. Geographic relocation is 11th on the list from the top. However, most newly graduating nurse anesthetists ($P=.0005$) who joined a practice at a site offered through their educational program did so at a site where they themselves had rotated.²⁷ A hospital offering a clinical rotation increased the chance approximately 3-fold for students, on graduation and subsequent certification, to move to the county of the hospital offering the rotation ($P=.0008$).²⁷ Similarly, among graduating anesthesiology residents who would probably consider an academic job, fewer than half ($P<.0001$) would “very probably” consider a hospital “located more than a 2-hour drive from a location where you or your family (eg, spouse or partner/significant other) have lived previously.”²⁸ The findings of these 2 previous studies^{27,28} differ from the current results because nurse anesthetists at a current position have, by definition, lived at that location.

In conclusion, in 2018, 14% of nurse anesthetists in the United States changed their primary position. In addition, 38% considered leaving their position. The combined incidence of approximately half the nurse anesthetists may seem strikingly high, but it is comparable to results for registered nurses in general. Ideally this benchmark information can assist chief anesthetists and other leadership if organization administrators think that their turnover incidence is unusually high, when it is, in fact, typical nationally.

REFERENCES

1. US Health Resources & Services Administration. Nursing workforce survey data. Accessed January 16, 2020. <https://data.hrsa.gov/topics/health-workforce/nursing-workforce-survey-data>
2. US Health Resources & Services Administration. National Center for Health Workforce Analysis, 2018 National Sample Survey of Registered Nurses, variance estimation guidance. Accessed January 16, 2020. <https://data.hrsa.gov/DataDownload/NSSRN/GeneralPUF18/Documentation.zip>
3. US Health Resources & Services Administration, National Center for Health Workforce Analysis, technical documentation for the 2018 National Sample Survey of Registered Nurses. Accessed January 16, 2020. <https://data.hrsa.gov/DataDownload/NSSRN/GeneralPUF18/Documentation.zip>
4. Dorelien M. *The Evaluation of Organizational Climate Within an Anesthesia Practice and Its Implications for Certified Registered Nurse Anesthetist Recruitment and Retention*. DNP project thesis. School of Nursing, University at Buffalo, State University of New York; 2019. Accessed February 2, 2020. https://ubir.buffalo.edu/xmlui/bitstream/handle/10477/81207/Dorelien_2020.pdf
5. Stata Corp LLC. svy jackknife, Jackknife estimation for survey data. Accessed January 30, 2020. <https://www.stata.com/manuals13/svsvy-vyjackknife.pdf>
6. Lindquist K. How can I estimate relative risk using GLM for common outcomes in cohort studies? Stata FAQ. Accessed January 30, 2020. <https://stats.idre.ucla.edu/stata/faq/how-can-i-estimate-relative-risk-using-glm-for-common-outcomes-in-cohort-studies/>
7. Hussein M. Using command svy glm to obtain risk ratios. Online forum. February 17, 2014. Accessed January 30, 2020. <https://www.stata.com/statalist/archive/2014-02/msg00668.html>
8. US Census Bureau. Census regions and divisions of the United States. Accessed January 30, 2020. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf
9. Epstein RH, Dexter F, Maratea EA. Unscheduled absences in a cohort of nurse anesthetists during a 3-year period: statistical implications for the identification of outlier personnel. *J Clin Anesth*. 2019;52:1-5. doi:10.1016/j.jclinane.2018.08.028
10. Soler JK, Yaman H, Esteve M, et al; European General Practice Research Network Burnout Study Group. Burnout in European family doctors: the EGPRN study. *Fam Pract*. 2008;25(4):245-265. doi:10.1093/fampra/cmn038
11. Hoff T, Whitcomb WF, Nelson JR. Thriving and surviving in a new medical career: the case of hospitalist physicians. *J Health Soc Behav*. 2002;43(1):72-91.
12. Dewa CS, Loong D, Bonato S, Thanh NX, Jacobs P. How does burnout affect physician productivity? A systematic literature review. *BMC Health Serv Res*. 2014;14:325. doi:10.1186/1472-6963-14-325
13. Samuels S. Prtest and survey weights. Online forum. March 13, 2010. Accessed February 7, 2020. <https://www.stata.com/statalist/archive/2010-03/msg00937.html>
14. Wang JO, Li CY, Kao S, Yeh TC, Arens JF, Ho ST. Factors associated with Taiwan anesthesiologists' intention to leave anesthesia practice. *J Formos Med Assoc*. 2015;114(6):509-516. doi:10.1016/j.jfma.2013.11.005
15. Wälinder R, Runeson-Broberg R, Arakelian E, Nordqvist T, Runeson A, Rask-Andersen A. A supportive climate and low strain promote well-being and sustainable working life in the operation theatre. *Ups J Med Sci*. 2018;123(3):183-190. doi:10.1080/03009734.2018.1483451
16. Lindfors PM, Meretoja OA, Luukkonen RA, Elovainio MJ, Leino TJ. Attitudes to job turnover among Finnish anaesthetists. *Occup Med (Lond)*. 2009;59(2):126-129. doi:10.1093/occmed/kqn173
17. Nooney JG, Unruh L, Yore MM. Should I stay or should I go? Career change and labor force separation among registered nurses in the U.S. *Soc Sci Med*. 2010;70(12):1874-1881. doi:10.1016/j.socscimed.2010.02.037
18. US Government Accountability Office. VA health care: Many medical facilities have challenges in recruiting and retaining nurse anesthetists. GAO-08-56. Published December 13, 2007. Accessed February 2, 2020. <https://www.gao.gov/assets/280/270336.pdf>
19. Meeusen VC, Van Dam K, Brown-Mahoney C, Van Zundert AA, Knape HT. Understanding nurse anesthetists' intention to leave

their job: how burnout and job satisfaction mediate the impact of personality and workplace characteristics. *Health Care Manag Rev.* 2011;36(2):155-163. doi:10.1097/HMR.0b013e3181fb0f41

20. Mahoney CB, Lea J, Schumann PL, Jillson IA. Turnover, burnout, and job satisfaction of Certified Registered Nurse Anesthetists in the United States: role of job characteristics and personality. *AANA J.* 2020;88(1):39-48.
21. Elmlad R, Kodjebacheva G, Lebeck L. Workplace incivility affecting CRNAs: a study of prevalence, severity, and consequences with proposed interventions. *AANA J.* 2014;82(6):437-445.
22. Dexter F, Masursky D, Hindman BJ. Reliability and validity of the anesthesiologist supervision instrument when Certified Registered Nurse Anesthetists provide scores. *Anesth Analg.* 2015;120(1):214-219. doi:10.1213/ANE.0000000000000510
23. Dexter F, Szeluga D, Masursky D, Hindman BJ. Written comments made by anesthesia residents when providing below average scores for the supervision provided by the faculty anesthesiologist. *Anesth Analg.* 2016;122(6):2000-2006. doi:10.1213/ANE.0000000000001337
24. Dexter F, Szeluga D, Hindman BJ. Content analysis of resident evaluations of faculty anesthesiologists: supervision encompasses some attributes of the professionalism core competency. *Can J Anesth.* 2017;39(5):53-56. doi:10.1007/s12630-017-0839-7
25. Dexter F, Hindman BJ. Quality of supervision as an independent contributor to an anesthesiologist's individual clinical value. *Anesth Analg.* 2015;121(2):507-513. doi:10.1213/ANE.0000000000000843
26. Dexter F, Ledolter J, Hindman BJ. Measurement of faculty anesthesiologists' quality of clinical supervision has greater reliability when controlling for the leniency of the rating anesthesia resident: a retrospective cohort study. *Can J Anesth.* 2017;64(6):643-655. doi:10.1007/s12630-017-0866-4
27. Wachtel RE, Dexter F. Training rotations at hospitals as a recruitment tool for Certified Registered Nurse Anesthetists. *AANA J.* 2012;80(4 suppl):S45-S48.
28. Dexter F, De Oliveira GS Jr, McCarthy RJ. First job search of residents in the United States: a survey of anesthesiology trainees' interest in academic positions in cities distant from previous residences. *A&A Case Rep.* 2016;6(2):34-38. doi:10.1213/XAA.0000000000000171

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