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ORIGINAL ARTICLE

Observational study evaluating obstetric anesthesiologist residents' well-being, anxiety and stress in a North American academic program

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ABSTRACT

Background: The obstetric work environment has a unique set of stressors that may be associated with burnout. We investigated how well-being during the obstetric anesthesia (ObA) rotation compared to other rotations; which workplace environment characteristics precipitated the greatest stress; and whether anxiety and stress levels changed in trainees before and after an ObA rotation.

Methods: Using a survey, anesthesia residents (n=36) ranked their well-being on each anesthesia rotation and answered questions about their work environment. A separate survey measured anxiety and stress before and after an ObA rotation. Friedman's test was used to compare ranking data and Likert responses. T-tests were used to compare stress and anxiety scores.

Results: Residents' ranking of well-being on ObA was higher than that on another high demand rotation (cardiothoracic anesthesia, $P=0.007$). Work environment stress scores were significantly higher among community and fairness domains than for workload ($P=0.002$ and $P=0.0001$, respectively). While stress and anxiety scores did not significantly differ before and after the ObA rotation, they were higher than the reference population scores.

Conclusions: We provide the first example of tools for assessing work environment stressors in ObA. Our study illustrates that beyond excessive workload, lack of fairness and community values are areas that impact physician well-being. Use of these tools can guide initiatives to address work environment concerns, and presents a need for a validated well-being instrument to gauge physician well-being, in order to create a cultural shift from burnout to one of well-being.

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Introduction

Over the last decade, there has been an increased focus on physician burnout, especially in the acute care environment.¹ In anesthesiology, numerous reports demonstrate a reduced work-life balance, an increased risk for burnout,^{2–7} and a growing concern for resident

well-being.^{8–10} These findings illuminate the importance of early identification of the stressful precipitators of burnout and has prompted the American Medical Association and Accreditation Council for Graduate Medical Education (ACGME) to emphasize the importance of monitoring and promoting well-being amongst clinicians-in-training.^{11,12}

The practice of obstetric anesthesia (ObA) is uniquely stressful and is not exempt from physician burnout. Nowhere else in anesthesiology exists a clinical environment where the experience so often involves high patient expectations (i.e. “perfect” birthing experiences), a frequent need for surgical intervention, and a desire to maintain an awake surgical patient with family members in the room. The recent prediction of a shortage of

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fellowship-trained obstetric anesthesiologists necessitates well-being among ObA residents to prevent attrition and avoid compromising the subspecialty's future.¹³ Previous studies have already shown that psychometric instruments can be used to monitor stress that leads to the development of burnout in physicians¹⁴ however these have not yet been applied in the context of ObA.

We conducted a prospective, observational study using psychometric instruments to evaluate three hypotheses: (1) that resident well-being during the ObA rotation is significantly worse than during other anesthesia subspecialty rotations, (2) that workload is the greatest contributor to resident distress during the ObA rotation, and (3) that stress and anxiety levels are higher after experiencing an ObA rotation.

Methods

This institutional review board-approved study was conducted in the Department of Anesthesiology at Columbia University Medical Center (CUMC) from 2016 to 2017. Two distinct surveys were used: a general well-being survey (GWS) (hypothesis 1 and 2) and a 'before and after' ObA rotation survey (hypothesis 3). To better understand the work environment at CUMC, we describe our model of ObA care.

The care demographics are an annual delivery volume of 4800, with a 35% cesarean delivery rate (~50% urgent) and a neuraxial labor analgesia rate of 90%. Up to 30% of patients are high-risk, managed antenatally by the maternal-fetal medicine team. Approximately eight high-risk ObA consults are seen per week and an additional 10 patients (with chronic comorbidities or abnormal placental implantation) are followed at multidisciplinary bi-weekly conferences.

The labor and delivery unit architecture includes 10 labor rooms, six high-risk beds, three operating rooms dedicated to obstetrics procedures and surgeries, four post-anesthesia recovery unit beds and six triage rooms.

The ObA team consists of two fellows and six residents who are directly supervised by one of the eleven ObA fellowship-trained attendings 24 hours-a-day, seven days-a-week.

The work schedule for residents is typically a 10-hour day-time shift and between seven to nine 24-hour on-calls during the rotation. Overall, weekly hours of all ObA residents ranged from 32 to 80 hours (average 67 hours). Morning didactic teaching on an ObA topic is provided every weekday. The day-shift usually comprises two attending anesthesiologists one fellow and three residents. During overnight, weekend, and holiday shifts, the team is composed of one anesthesiologist and two residents.

The GWS (Appendix 1) was sent to the CUMC anesthesiology residency program (n=78) in March 2016

(SurveyMonkey Inc., Portland, OR). To ensure anonymity, only the clinical anesthesia training year (CA-1, CA-2 or CA-3) was collected. Resident non-responders received up to five follow-up reminder emails over a three-week period. Non-responders were not included in the study.

The GWS was comprised of one demographic question (Q) (Q1), followed by assessments of well-being needs and resources (Q2, 10, 11 and 12); a rank order of perceived well-being across eight anesthesia subspecialties (Q3), and an assessment of areas of work-life stress (AWS) relevant to anesthesiology (Q4–9). Question 3 asked residents to rank their well-being (1=least well, 8=most well) comparing eight subspecialty rotations (pain, obstetric anesthesia, cardiac anesthesia, intensive care unit, general anesthesia, pediatric anesthesia, regional anesthesia, and post-anesthesia care unit). Since some residents had not completed all rotations at the time of the survey, only responses from residents who had completed all eight sub-specialty rotations were included in the analysis.

Questions 4–9 assessed Maslach and Leiter's six domains that contribute to workplace burnout and engagement.¹⁵ These six domains are: workload, community, values, fairness, reward, and control. Domains receiving higher scores indicate areas that support workplace engagement while domains receiving lower scores specify areas that promote burnout.¹⁵ Given the lack of a validated well-being survey for physicians-in-training, we modified select Likert-scale questions from a physician well-being survey utilized at an ACGME Pediatric Program Directors Annual Meeting to assess the six domains from Maslach and Leiter's workplace burnout inventory. In our opinion these modifications were more clinically applicable to ObA than the original questionnaire. Each domain was evaluated with between one to eight statements, depending on the applicability and relevance to training conditions in ObA.

Surveys measuring anxiety and stress levels before (Appendix 2) and after (Appendix 3) the ObA rotation were sent to each group of ObA rotating residents (n=6/month) between November 2016 and July 2017. The post-rotation survey included additional questions requesting ratings and opinions on new teaching and debriefing methods we had initiated. The surveys were administered electronically through Qualtrics software (Qualtrics, Provo, UT and Seattle, WA) at each of the two time-points (n=54). Post-rotation survey non-responders were sent a single reminder after 24 hours. Any residents that did not complete the pre- and post-survey were omitted from the study.

Anxiety was measured using the Spielberger State Anxiety Inventory for Adults (SAI-AD)¹⁶ and stress level was quantified using the Cohen Perceived Stress Scale

(PSS-14).¹⁷ Scores are scaled so that a higher SAI-AD score indicates greater levels of anxiety and a higher PSS-14 score indicates higher perceived stress.¹⁷⁻¹⁹

STATA software (Version 14) was used for all analyses. As Q3 in the GWS involved ranking different subspecialties, the Friedman test was used as an omnibus test to assess for a difference between any of the subspecialties, with an a priori level of significance set to $\alpha=0.05$. The Wilcoxon signed rank test was then used for post-hoc analysis, comparing the ranking for ObA with the rankings for each of the remaining seven subspecialties, with a Bonferroni correction a priori level of significance set to $\alpha=0.0071$ ($\alpha=0.05/7$). Additionally, we compared the median and interquartile ranges (IQR) of each subspecialty. A higher median score signified better well-being on the rotation. The IQR indicates where most responses (the 25th–75th percentile of responses) lie on a distribution curve.²⁰

The evaluation of workload compared to other AWS was performed with a non-parametric Friedman test, to

test the null hypothesis of no difference in Likert responses among the six AWS. A post hoc analysis for the 16 possible pairwise comparisons was performed using the Wilcoxon signed rank test (Bonferroni corrected $\alpha=0.003$). Each of the 20 statements was also ranked by the weighted average of responses ($n=29$). To analyze stress and anxiety levels before and after the ObA rotation, SAI-AD and PSS-14 scores were compared using paired t-tests.

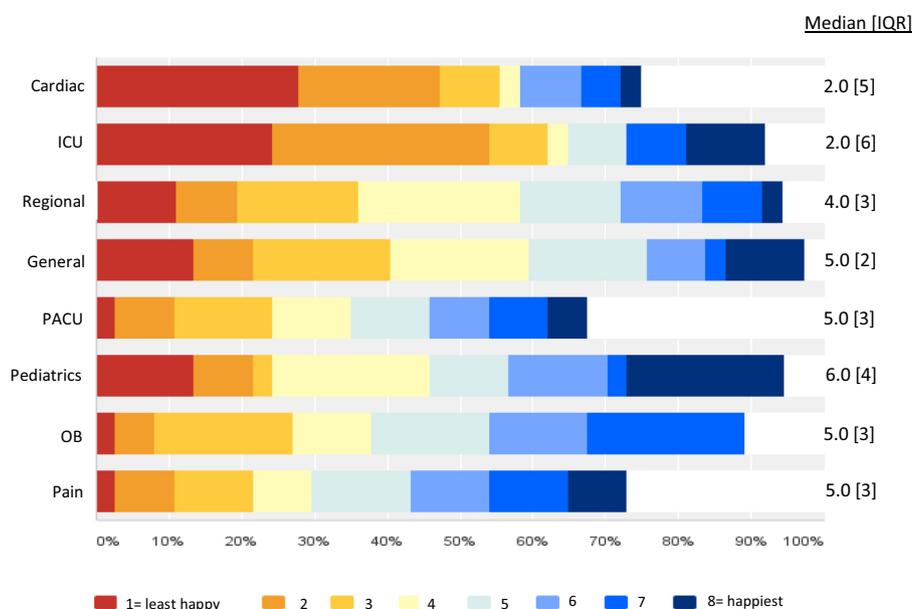
Results

General well-being survey

The overall response rate was 46.1% (36/78 residents, Fig. 1). Of the residents who completed the survey, the number of CA-1s, CA-2s, and CA-3s was 13 (36.1%), 12 (33.3%), and 9 (25%), respectively. Two respondents chose not to disclose their training status (CA year). Of 36 respondents, 23 had completed all eight rotations and were able to rank compare all eight subspecialties.

	CA-1	CA-2	CA-3	Did not disclose	Total
Completed all 8 subspecialty rotations	1 (2.8%)	12 (33.3%)	9 (25%)	1 (2.8%)	23 (63.9%)
Had not completed all 8 rotations	12 (33.3%)	0 (0%)	0 (0%)	1 (2.8%)	13 (36.1%)
Total	13 (36.1%)	12 (33.3%)	9 (25%)	2 (5.6%)	36 (100%)

Fig. 1 General well-being survey (GWS) respondents ($n=36$). Amongst the 36 survey respondents, 23 respondents had completed rotations in all eight anesthesia subspecialty rotations and were able to rank all rotations for question 3 on the GWS. Analysis of question 3 was performed only on the 23 complete answer-sets. *CA-X=Clinical anesthesia-training year.



* Residents answered "N/A" if they have not rotated on the rotation. Therefore, values do not add up to 100%.

Fig. 2 Resident subspecialty well-being rankings by residents who completed all eight rotations ($n=23$). Distribution and frequency (x-axis) of rank scores stratified by subspecialty rotation (y-axis). Rank order ranged from 1 (least well) to 8 (most well). The median rank score and interquartile range [IQR] of obstetric anesthesia was 5.0 [4–7]. Well-being rank order for obstetric anesthesia was not significantly worse than all other work environments (Friedman test). However, well-being was better compared to cardiac anesthesia (median 2.0 [1–6]) (Wilcoxon rank sum test).

We compared the scores of each subspecialty ranking to gauge resident well-being on that rotation (Fig. 2). The median 'well-being' rank and interquartile range [IQR] for the ObA and cardiac rotations were 5 [4–7] (n=23) and 2 [1–6], respectively. Analyzing the 23 complete survey responses, a significant difference among rankings between the rotations was seen

($P=0.015$). Using the ObA scores as the reference group, the ObA rotation scores were significantly higher (wellness on this rotation ranked better) than cardiac anesthesia scores ($P=0.007$). The ObA rotation scores were not significantly different from any other subspecialty.

Through the Friedman test, there was a significant difference in Likert responses among the six different

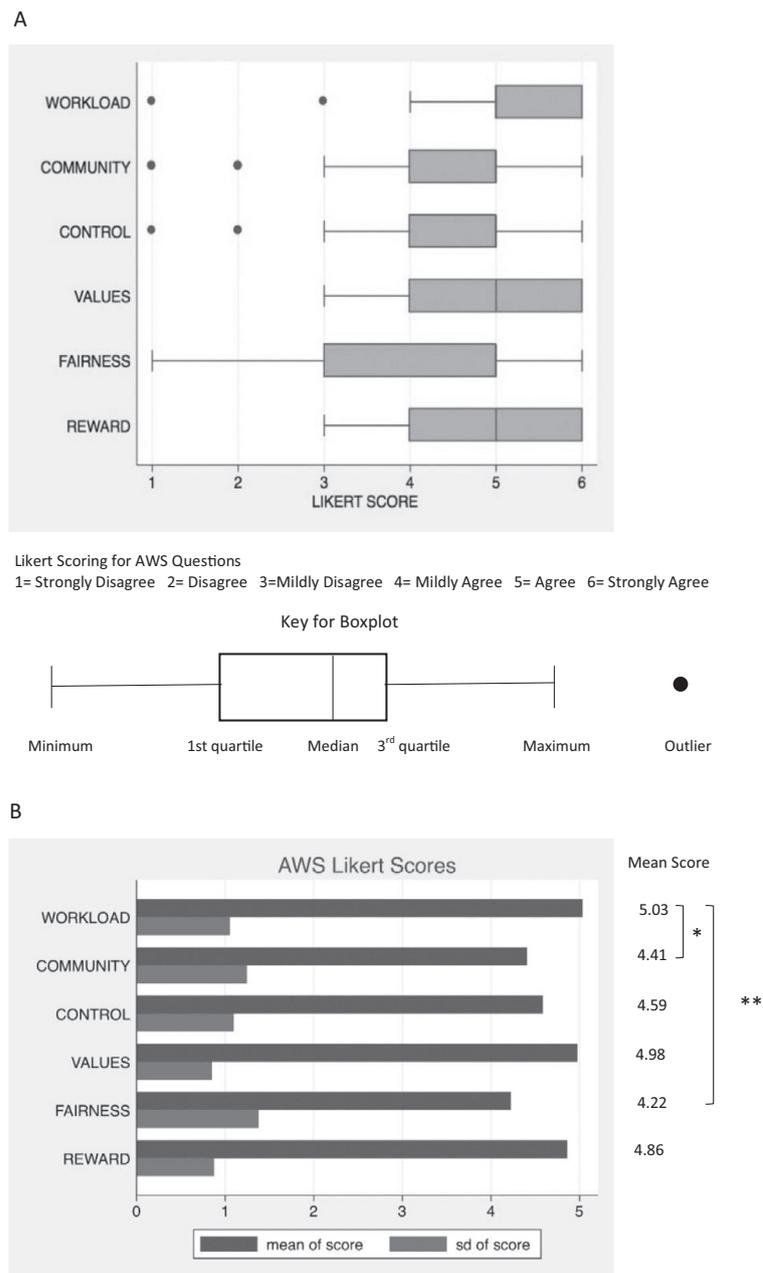


Fig. 3 Medians and means of the six areas of work-life stress (AWS) on the obstetric anesthesia rotation. (A) Box plot of Likert scores as scored by residents (n=37) displaying IQR (see boxplots key). (B) Graph of mean and standard deviation (sd) of the six areas of work-life stress. Friedman test analysis recorded significant differences among the six areas of work-life (chi²=25.00, $P < 0.0001$). Workload was found to be the most congruent with work demands and resident expectations of work environment (mean 5.03) and was found to be significantly different compared to two other areas of work-life stress: community and fairness ($z=3.117$, $P < 0.0018$ and $z=3.70$, $P < 0.0002$, respectively). Fairness (**) and community (*) presented as the two biggest drivers of burnout, based on the residents' Likert score scale. The fairness category included questions regarding blame and call assignment fairness. The community category included questions on respect, communication, mentorship, and teamwork.

	Weighted Average
My schedule requests are received and considered on OB anesthesia. *	5.21
I feel that the workload is manageable on OB anesthesia.*	5.03
I feel well-respected by my attendings, nurses, and the OB team.	4.62
As a resident/fellow, I rarely encounter blame for other people's decision making. ***	3.52
I am able to identify a faculty mentor that I am capable of safely expressing feelings to. ***	3.52
I engage in activities that encourage community growth.***	3.17

Fig. 4 Examples of Individual Statements of the Areas of Worklife Stress (AWS) Survey. The three lowest-scoring statements in the AWS survey were in the community and fairness domains.*** Statements pertaining to workload and scheduling received the highest weighted averages out of all 20 individual AWS statements.*

AWS during the ObA rotation ($\chi^2=25.00$, $P<0.001$). In post hoc analysis of Likert data, 'workload' was rated higher than both 'community' and 'fairness' ($z=3.117$, $P<0.0018$; $z=3.70$, $P<0.0002$, respectively) (Fig. 3). The lowest-scoring individual items were lack of mentorship, being blamed for other people's wrong-doing and lack of personal engagement to community growth (Fig. 4).

Anxiety and stress survey

Of 54 residents who completed the ObA rotation, 31 residents (57.4%) answered the pre-ObA survey and 16 (29.6%) answered the post-ObA survey. Sixteen residents answered both the before and after surveys, so only 16 sets of anxiety scores were analyzed. There were missing data in two PSS-14 surveys, so stress was evaluated for only 14 respondents.

The SAI-AD scores were 47.8 ± 6.4 before versus 47.8 ± 7.6 after (mean difference 0.06 ± 7.99 ; $P=0.98$). The PSS-14 scores were 21.6 ± 8.8 before versus 19.8 ± 6.8 after (mean difference $-1.86 \pm$, SD 7.15; $P=0.53$). There was no statistically significant difference between the before and after ObA rotation anxiety and stress scores.

Discussion

The primary finding of our study was that self-reported well-being on ObA was comparable to all other anesthesia subspecialty rotations. This finding is contrary to our expectations, as we had presumed that the high acuity

and volume of activity on ObA would result in decreased scores. The second major finding of our study was that residents' views regarding workload on ObA had a significantly lower impact in generating resident stress than experiences pertaining to community and fairness categories. Among stressors known to be contributors of workplace environment-associated burnout, trainees ranked issues relating to poor professionalism (such as perceived lack of respect) to be the most impactful. The third major finding was that stress and anxiety levels did not significantly change before and after the rotation. This is the first study in the field of ObA to report on and monitor trainee well-being and study relationships between known precipitators of burnout.

The ObA rotation scores signified better wellness than during the cardiac anesthesia rotation, despite more weekly duty hours (mean 67 versus 57 h) and more weekend and night shifts (Fig. 5). Therefore, it seems unlikely that work schedules and duty hours made a big impact on the rank differences we observed. We were surprised to see the high ObA rank, despite two unexpected maternal deaths during the study period. These unexpected tragedies did not seem to decrease residents' sense of well-being. Possible reasons for this include the debriefing sessions offered with dedicated psychologists and a sense of meaning from saving a baby. Although controversial, as previous studies found subspecialization in anesthesiology not helpful in resident education,^{21,22} we found that the supervision and education provided by a dedicated team of ObA fellowship-

	Obstetric Anesthesia	Cardiac Anesthesia
Resident Demographics		
Number of residents per rotation	6	6
Composition	2 initial rotators (CA-1* or CA2) 2 junior rotators (CA2), 2 senior rotators (CA3)	2 initial rotators (CA1 or CA2), 2 junior rotators (CA2), 2 senior rotators (CA3)
Work Hours		
Average Number of Work Hours	57	57
CA1	65	55
CA2	55	57
CA3	51	59
Average Daily Work hours	9 hours (7am-4pm)	11 hours (530am-430pm)
Call System		
Type of call	In-house call	Home Call
Type of call shifts	24-hour call, night float	24-hour call
Number of weekends on-call (out of 4)	3	1
Number of overnight calls per month	8	2
Resident Education		
Didactics	45 minutes daily	1 hour bi-weekly
Work Environment		
Surgeon interactions	Obstetricians	Cardiothoracic surgeons
General patient population	Parturients - many high-risk women requiring maternal fetal medicine care, generally happy to be at hospital for a happy life event	Elderly ASA** class 3-4 patients, majority need ICU care post-op

Fig. 5 Comparison of Obstetric and Cardiac Anesthesia Rotation Characteristics Residents ranked well-being better on the obstetric anesthesia than on the cardiac rotation, despite the differences seen on this table. The obstetric anesthesia rotation generally had more weekly work hours and more overnight calls than the cardiac anesthesia rotation, suggesting that work hours and workload may not impact well-being as much as previously proposed. The obstetric anesthesia rotation also had more dedicated resident education time and different patient and surgeon populations demonstrating that workplace well-being is multifactorial and future studies ought to look at characteristics that promote workplace engagement as well as burnout. *CA-X: Clinical anesthesia-training year **ASA: American Society of Anesthesiologists Physical Status Classification System.

trained attendings and the ability to provide immediate support to our residents were possible positive contributors to resident well-being.^{23,24} More studies are needed to investigate the effects of the availability of attending anesthesiologists specifically for ObA. While these results are specific to our institution and not generalizable to other training programs, the methodology we employed may allow other programs to identify areas of reduced trainee well-being and/or direct more attention to identifying rotation characteristics that are worthy of emulation.

We hypothesized that high workload would be the biggest source of workplace burnout, based on evidence linking excessive work hours to burnout²⁵⁻²⁸ and the portrayal of workload as toxic in popular culture.^{29,30} In the United States (U.S), resident work hours have undergone considerable regulation following the Libby Zion case.^{31,32} Perhaps due to these regulations, we found that work hours and workload was not the largest

contributor to ObA work environment stress. The majority of our respondents rated their workload as manageable. The largest sources of work stress identified were a lack of mentorship, being blamed for other people's decision-making and a lack of personal engagement in community growth. Our findings are consistent with research suggesting burnout was due to the nature of the work rather than the actual work itself.³³ These results highlight the importance of promoting mentorship, professionalism and engagement in the workplace.

Common mental and physical stressors on the labor and delivery unit, such as managing rapid and copious maternal bleeding, have been noted to create burnout symptoms amongst healthcare workers and safety issues in patient care.³⁴⁻³⁶ However, our study found that stress and anxiety did not increase following the ObA rotation. Consistent with our results, another study also found anxiety levels to be stable after similar stressor

exposure in anesthesiology trainees.³⁷ Interestingly, our residents did exhibit higher baseline anxiety and stress levels than normative population stress and anxiety scores.¹ The pre-rotation anxiety scores in our cohort of residents (n=31) were significantly higher than published reference-value anxiety scores (48.34 ± 6.30 versus 36.42 ± 10.46). Similarly, the pre-rotation stress scores were significantly higher than reference population stress scores (21.58 ± 7.71 versus 17.4 ± 6.4). A previous study using the Depression Anxiety Stress Scale (DASS-21) also found anesthesiology residents to have higher anxiety and stress levels compared to the reference population.³⁸ These findings may represent a tendency of high stress and anxiety personality types among residents choosing the field of anesthesia or that they have become acclimatized through chronic exposure to environmental stressors.

We acknowledge several limitations to our study. First, the response rates in the well-being survey and the pre- and post-ObA rotation surveys were 46.1%, 57.4%, and 29.6%, respectively. While comparable to physician response rates published in qualitative research studies,^{39–41} the low response rates limit generalizability. Possible reasons are despondency in particular residents, unsolicited email fatigue or even increased physician burden itself.⁴² Our AWS survey also revealed the lack of personal engagement to community growth in our program, which might also explain our low response rates.

A second limitation was the limited scope of validated psychometric instruments. In particular, we did not utilize important tools like the DASS-21, which have recently been used at other large United States of America academic centers to assess resident well-being.³⁸ After an extensive search for the best validated instrument to assess physician well-being, we could not identify an instrument. There are validated burnout inventories, but none were focused on well-being or were specific for physicians. Therefore, there is a need for a validated physician well-being instrument.

A third limitation was the timing of administration of the AWS survey. Sending the AWS assessment out at one time-point may skew our results if residents were on a particularly ‘hard’ or ‘easy’ rotation compared to ObA when the survey was taken. For future studies, we plan to administer the AWS at the end of each ObA rotation. Finally, we did not perform certain subgroup analyses, to identify the possible effects of gender, marital status or training experience (CA-1 to CA-3) on reported well-being.

In conclusion, our study provides novel findings about resident well-being in ObA at a large U.S. aca-

ademic center. Resident well-being scores were better overall during the ObA rotation compared to those during some other subspecialty environments. We found that the greatest sources of decreased workplace quality were lack of fairness (being blamed for other people’s decision-making) and lack of community (no identifiable mentor for residents and no resident engagement in community growth). Both may be improved with increased professionalism at the workplace. While our residents’ anxiety and stress levels were higher than reference population values, we found that the ObA rotation itself did not increase stress and anxiety levels above baseline. These findings provide a reference and methodology that may allow other programs to measure and improve physician well-being. Our study also suggests the need for a validated well-being instrument to gauge physician wellness, in order to create a paradigm shift that focuses on promoting well-being rather than managing burnout.

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¹ Demographic data (e.g. age) was not collected in our survey. However, we used Spielberger’s normative value for working adults ages 19–39 (mean 36.42 ± 10.46) years for anxiety (16) and Cohen’s normative value for the demographic category of people with advanced degrees of stress (mean 17.4 ± 6.4) (17).

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijoa.2018.10.011>.