


A Study of Otolaryngology Resident Quality of Life and Sleepiness

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Objectives: This study aimed to determine otolaryngology residents' quality of life and sleepiness.

Methods: An electronic survey was distributed to otolaryngology residents in the United States in October 2014 and May 2015. The survey included questions from the Physician Well-Being Index (PWBI) and Epworth Sleepiness Scale (ESS). Data were analyzed using standard descriptive and frequency analyses, Spearman correlations, and Student's t-test.

Results: The 196 respondents (13% response rate) had a mean age of 29.9 years and worked an average of 70.88 hours/week. Higher PWBI score (lower quality of life) correlated with higher ESS (more sleepiness) for all respondents regardless of rotation (Spearman coefficient of .45; $p = .001$). PWBI scores were higher for head/neck oncology. Both PWBI and ESS scores were highest for postgraduate year two. PWBI showed a significant positive correlation with hours worked (correlation coefficient .35; $p = .001$) as well as a significant negative correlation with exercise time (correlation coefficient $-.18$; $p = .010$). There was a positive correlation between hours worked and ESS (correlation coefficient .48; $p = .001$).

Conclusion: For the otolaryngology survey respondents, sleepiness and overall well-being were better during the first year with a dramatic worsening during junior years followed by an improvement in the senior years. More work hours and poor quality of life was associated with less physically active residents. Focused interventions during these rotations may reduce distress, improve quality of life, and enhance learning.

Key Words: Quality of life, sleepiness, residency, burnout, otolaryngology.

Level of Evidence: NA

INTRODUCTION

Although residency is a stressful time, most resident well-being studies have focused on primary care and rarely pertain to otolaryngology residents. Wide ranges of depression (7%–56%) and burnout (41%–76%) have been reported in residents.^{1–3} Burnout is defined as lowered perception of one's health status, lowered satisfaction with career, emotional exhaustion, adaptive detachment,² depersonalization, and low perceived personal accomplishment.^{4–6} Daily situations, including stressful oncologic encounters and lack of sleep, contribute to the burden.⁴ These stressors are exacerbated by sleepiness and lack of leisure time.¹ Resident fatigue, sleepiness, and distress are associated with self-perceived medical errors^{4,7,8} and self-reported

medication errors.¹ The Institute of Medicine estimated that medical errors cause 44,000 to 98,000 patient deaths per year.⁹ Depressed residents have a sixfold higher medication error rate than non-depressed peers and nearly half of these physicians are not cognizant of their depressed status.¹ Burnout, depression, and quality of life (QOL) have not been shown as predictors of standardized testing results.¹⁰

To our knowledge, no specific studies have evaluated or screened otolaryngology residents' well-being or QOL in different rotations via a validated survey. We undertook this study to identify whether specific rotations and training years within otolaryngology are associated with higher distress, defined as lower resident levels of well-being (burnout, depression, stress, fatigue, and mental and physical QOL) and higher sleepiness.

MATERIALS AND METHODS

This study aimed to assess well-being and sleepiness levels by rotation and training year for otolaryngology residents in the US. In October 2014 and May 2015 the same survey was sent via SurveyMonkey (www.surveymonkey.com, Palo Alto, CA) to all US otolaryngology program directors and coordinators with a request to distribute to their residents. The different survey times were done to measure seasonal affect or beginning versus late time of academic year effect. All residents remained anonymous to the research team and program information was not obtained. Duplicate responses were prevented by adjusting SurveyMonkey settings. During a one-month time period for each survey, three email reminders were sent.

Completion of certain questions pertaining to sleepiness and well-being were mandatory to submit the survey. Basic demographic information obtained included age, gender, race

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Editor's Note: This Manuscript was accepted for publication 14 January 2017.

Conflicts of Interest: None to declare.

Financial Disclosures: None.

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DOI: 10.1002/liv.2.69

(based on US Census definition), relationship status, number of children, residing national region, postgraduate year (PGY) level, amount of exercise weekly, and hours worked per week. Rotation categories for selection were head/neck oncology, laryngology, general, pediatric, research, neuro-otology, and "other" with ability to write an answer.

The survey included questions from the Epworth Sleepiness Scale (ESS) to measure resident sleepiness and the Physician Well-Being Index (PWBI) to measure resident well-being or QOL. The ESS is a self-administered, validated 8-question survey pertaining to level of sleepiness during common daily activities.¹¹ Responses utilize a 4-point Likert scale (0–3, with 3 "having a high chance of dozing").¹² Higher scores indicate higher levels of sleepiness, with scores greater than 10 indicating significant sleepiness supporting further clinical work up. In the current sample, the ESS demonstrated good reliability (Cronbach's $\alpha = .88$). The PWBI is a validated, seven-question screening survey for evaluating burnout, stress, fatigue, mental and physical QOL, and depression.¹³ A material transfer agreement was obtained from the Mayo Foundation for Medical Education and Research for use of the PWBI in this study. Responses are binary (yes = 1, no = 0) with higher scores indicating worse well-being. At a threshold score of ≥ 5 , the specificity for detecting residents with low mental QOL, high fatigue, and recent suicidal ideation is 83.6% and the sensitivity is 70.3%.¹³ In previous research, residents with higher scores were also more likely to have committed a recent medical error.¹³ In the current sample, the PWBI demonstrated acceptable reliability (Cronbach's $\alpha = .70$).

Analyses were completed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). Demographic information, PWBI, and ESS were analyzed using standard descriptive and frequency analyses. The PWBI and ESS scores were compared between groups defined by binary nominal variables such as gender and race using two-sample nonparametric Wilcoxon tests. Variables with multiple strata, such as experience and geographic location had all pairwise comparisons examined using two-sample Wilcoxon tests. A Hochberg's method was used to adjust for multiple testing. Those variables which were continuous in nature were examined using nonparametric Spearman correlations. The nonparametric approach was indicated by the non-normal distributions of the data.

Our health system's Institutional Review Board approved this study.

RESULTS

No significant differences in respondent characteristics or outcomes were found between the two survey groups and thus both cohorts were combined for ease of results and discussion. This was also done because it was not possible to link any individual's fall survey to his/her spring survey as participants were anonymous and individual comparisons could not be made.

Of 107 otolaryngology programs in the US and about 299 positions per year, an estimated 1,495 residents were eligible for the study.¹⁴ We received 105 responses in the fall (7% response rate), survey and 91 responses in the spring survey (6% response rate), combined response rate was (196/1495) 13%. The 196 total respondents had a mean age of 29.9 years and worked an average of 70.88 hours/week (Table I and Table II). Using US Census Bureau data for regions, 42% (82/196) of respondents were from the East, 24.5% (48/196) from East Central, 10.7% (21/196) from West Central, and 23% (45/196) from the West. The number of respondents by PGY level

is presented in Figure 1. Most respondents were in general otolaryngology ($n = 58$, 29.6%), followed by head and neck oncology and "other" (both $n = 37$, 18.9% each) (Figure 2). The "other" rotations included neurosurgery ($n = 8$); no rotation ($n = 6$); plastic surgery, general surgery, site based, and VA hospital ($n = 4$ for each); and thoracic surgery, surgical intensive care unit, urology, float, emergency department, other, and anesthesiology ($n = 1$ for each). The "other" group was composed of 19 PGY1 respondents, hence the diversity in rotations.

Well-Being and Sleepiness Outcomes

For the PWBI portion of the survey, 33% of respondents scored ≥ 5 , the cutoff associated with poor resident outcomes. The average PWBI score was 3.89 (SD = 1.92). The PWBI question on feeling "burned out from your work" was the most endorsed ($n = 148$, 75.5%), followed by "emotional hardening" ($n = 133$, 67.9%). For ESS, 58% of respondents scored ≥ 10 , the cutoff point that may warrant further evaluation. The average ESS score was 11.87 (SD = 5.22). Most respondents said they were most likely to fall asleep when "lying down to rest in the afternoon when circumstances permit" (85.2% at moderate to high chance of dozing), followed by "sitting and reading" (73.5% at moderate to high chance of dozing).

There were no significant gender differences on the PWBI. On the ESS, women had a significantly higher or worse ESS score compared to men (12.71 ± 5.04 vs 11.16 ± 5.32 , $p < 0.05$) (see Table II). No statistically significant differences occurred in respondent relationship status, number of children, or race for either the PWBI or ESS.

There were no significant correlations between age, number of children, or PGY level and PWBI or ESS score. There was a positive correlation of hours worked with both PWBI and ESS ($\rho = .35$, $p < .001$ and $\rho = .48$, $p < .001$, respectively), indicating increased work hours were associated with worse well-being and increased sleepiness. There was a negative correlation between the PWBI and exercise ($\rho = -.18$, $p < .01$), indicating that less exercise was associated with worse well-being.

The experience analysis (Figs. 3 and 4) comparing PGY levels demonstrated that PGY1 (average = 2.57, SD = 1.57) had a significantly better well-being compared to PGY2 (average = 4.30, SD = 1.61, $p = .001$). Well-being for PGY2 was also significantly worse compared to PGY4 (average = 3.26, SD = 2.06, $p = .033$). PGY1 residents (average = 10.77, SD = 4.47) had significantly less sleepiness compared to PGY2 (average = 14.72, SD = 4.46, $p = .001$) who were also significantly worse compared to PGY4 (average = 10.68, SD = 5.73, $p = .001$) and PGY5 (average = 11.11, SD = 5.26, $p = .002$).

Spearman correlations between PWBI and ESS were performed within each of the eight otolaryngology rotations. Overall, the total scores on the PWBI and ESS were significantly and positively correlated ($\rho = .43$, $p < .001$). Significant correlations were found between the following rotations and ESS and PWBI: "other" ($\rho = .60$, $p = .003$) and research ($\rho = .63$, $p = .001$). This indicates that these rotations were associated with higher

TABLE I.
Information Regarding Gender, Race, Age, Hours Worked per Week, Relationship Status and Number of Children

Measures	% (r/n)	n	Mean	SD	Median	Q25	Q75
Gender							
Female	46 (89/195)						
Male	54 (106/195)						
Race							
White	69 (132/190)						
Asian	22 (41/190)						
Black	3 (5/190)						
Multiple	6 (11/190)						
Native American	1 (1/190)						
Age		196	29.91	2.70	30.00	27.00	30.00
Hours worked		194	70.88	10.10	75.00	65.00	75.00
Exercise (30m)		196	1.88	1.53	1.50	0.50	2.50
0-1	38 (74/196)						
1-2	24 (48/196)						
2-3	17 (33/196)						
3-4	14 (28/196)						
5-7	7 (13/196)						
Sleep hrs/night							
<5	7 (13/195)						
5-6	64 (125/195)						
7-8	29 (57/195)						
Children							
0	81 (158/196)						
1	10 (19/196)						
2	7 (1/196)						
3	3 (5/196)						
>3	1 (1/196)						
Relationship status							
Married	83 (161/195)						
Single	17 (14/195)						

ESS = Epworth Sleepiness Scale; PWBI = Physician Well-Being Index

sleepiness and lower well-being. No significant correlation was found for pediatric, general, head and neck, laryngology, neuro-otology, or sinus/rhinology.

All pairwise comparisons were performed using a Wilcoxon two-sample test. The PWBI scores showed that respondents in the head and neck rotation (average = 4, SD = 1.58) reported significantly ($p = .004$) worse well-being than those in "other" rotation (average = 2.78, SD = 2.14). None of the ESS pairwise comparisons were significant.

Geographically, the West had significantly higher sleepiness than East Central (average = 13.22, SD = 4.28 vs. average = 9.98, SD = 5.78; $p = .007$). No other geographic locations were significant for sleepiness or well-being.

DISCUSSION

For respondents to this study of otolaryngology residents in the US, sleepiness and overall well-being were better during the intern year with a dramatic worsening

during junior years followed by an improvement in the senior years. It is important to note that sleepiness and well-being levels in senior residents did not return to baseline (PGY1 levels). Similar to our findings, a study evaluating PGY1 medical residents reported a significant increase in chronic sleep deprivation, depression, and burnout across the intern year.¹⁵ The same study noted a strong correlation between chronic sleep deprivation and the development of moderate depression.¹⁵ The burnout effect also appears to have a cumulative effect over time.³ Another study of medicine residents noted that senior residents (PGY3) had the highest QOL and more junior residents (PGY1 and 2) and women had more work-life balance dissatisfaction and emotional exhaustion.¹⁶ In that study, the symptoms improved with increased PGY level.¹⁶ We speculate this difference in otolaryngology PGY1 versus medicine PGY1 is that medicine residents start within their fields whereas otolaryngology residents begin as rotators.

TABLE II.
Comparison of PWBI and ESS Between Different Groups

Variable	n	Mean	SD	Median	Q25	Q75	p-value
Total scores							
PWBI	196	3.39	1.92	3.50	2.00	5.00	
ESS	196	11.87	5.22	11.50	8.00	16.00	
PWBI							
Gender							
							.063
Male	106	3.16	1.84	3.00	2.00	5.00	
Female	89	3.65	2.00	4.00	2.00	5.00	
Race							
							.599
White	132	3.28	1.94	3.00	2.00	5.00	
Non-white	58	3.45	1.83	4.00	2.00	5.00	
Relationship							
							.561
Married	161	3.35	1.96	3.00	2.00	5.00	
Single	34	3.56	1.76	4.00	2.00	5.00	
ESS							
Gender							
							.018
Male	106	11.16	5.32	10.00	7.00	15.00	
Female	89	12.71	5.04	13.00	10.00	16.00	
Race							
							.886
White	132	11.77	5.44	11.00	8.00	15.00	
Non-white	58	11.72	4.72	11.00	9.00	16.00	
Relationship							
							.790
Married	161	11.83	5.40	11.00	8.00	16.00	
Single	34	11.87	4.42	12.00	10.00	15.00	

Overall, otolaryngology respondents in our study have higher than average daytime sleepiness. The correlation between well-being and sleepiness may imply that as sleepiness increases there is a worsening in well-being. Of note, well-being was the worst in the head and neck rotation, likely due to the high stress and care of the critically ill patient. These findings corroborated a recent study evaluating surgical oncology residents which found high sleepiness levels, depression, burnout, and more self-reported medical errors.⁴ Interestingly, in that study residents reported less fatigue but high sleepiness level, indicating that residents may have

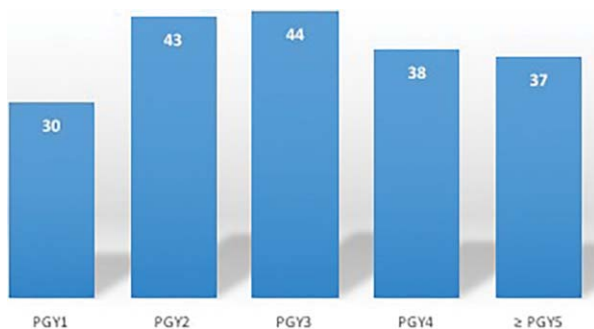


Fig. 1. PGY level of the respondents. Abbreviations: PGY = postgraduate year.

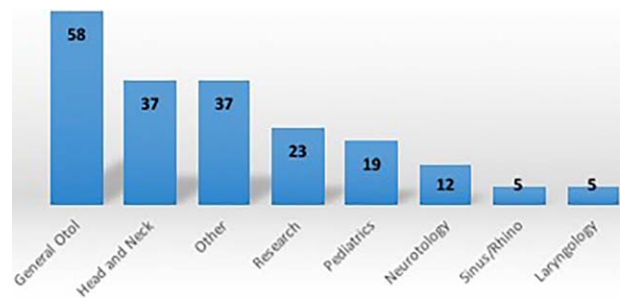


Fig. 2. Current rotation of the respondents.

underestimated or under-reported actual levels of tiredness.⁴ As expected, the “other” rotation had the highest well-being; these rotations were mainly off service, resulting in less stress due to a 16-hour shift, 80-hour work week,¹⁷ more flexible/shorter hours, and less stress from the continuous scrutiny to excel in front of their own future peers. Pediatric otolaryngology and head and neck oncology had higher sleepiness compared to the research rotation, likely due to longer operative times¹⁸ and greater clinical or teaching duties on these rotations.¹⁹ More sleepiness was also found in the Head and Neck rotation by Nida et al.²⁰ In our institution, the research rotation has dedicated research time without clinical duties unless emergencies arise, giving the resident more control over schedule and life.

Our study’s residents had a substantially lower mean time engaged in intentional physical activity than the average 30–60 minutes/week recommended by the Centers for Disease Control and Prevention (CDC).²¹ Studies have shown that the recommended amount of exercise has been associated with improved QOL and learning, higher resiliency, and lower burnout.^{22–24} Other research has demonstrated that resident and fellow physicians are less likely to engage in physical activity compared to medical students and staff physicians, with a higher body mass index associated with more work hours per week.²⁵ The same study also found that residents who worked less than 70 hours a week and had no children were more likely to meet the CDC guidelines for exercise.²⁵ Although not the focus of our study, our results parallel other studies of residents who work on

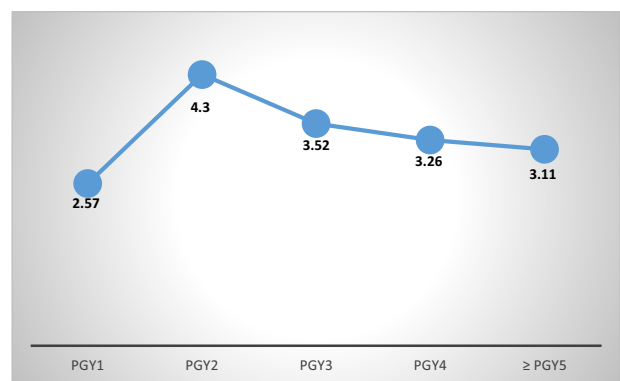


Fig. 3. The trend of PWBI score versus PGY level. Abbreviations: PGY = postgraduate year; PWBI = Physician Well-Being Index.

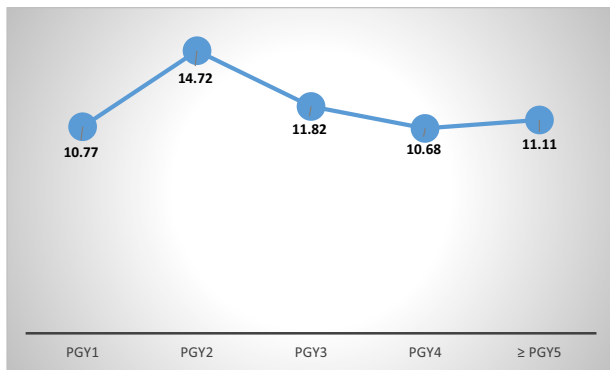


Fig. 4. The trend of ESS score versus PGY level. Abbreviations: ESS = Epworth Sleepiness Scale; PGY = postgraduate year.

average 70 hours per week and do not meet CDC guidelines, despite most of them not having children. It could indicate that our residents are allocating the “extra hours” to sleeping, but most reported about 5–6 hours of sleep per night. It is likely that, after considering other responsibilities and demands on the resident physician’s time, physical activity is not a priority for residents.

We found no significant gender differences in QOL in our study based on PWBI, however, our women respondents were approaching achieving a significantly worse QOL. This partly concurs with previous research that found no gender differences in burnout.² Goldhagen et al.⁶ found that PGY1 and PGY2 females had a higher depression-anxiety-fatigue score than males, and mindfulness-based intervention helped improve the scores. They speculated that women have additional demands outside of work and family planning stresses.⁶ Interestingly, women in our study reported significantly higher sleepiness than men, supporting the hypothesis that women may have more non-work-related duties.

Research on happiness has reported higher levels of happiness in those living in the West coast compared to the East coast.²⁶ Our study revealed the highest well-being in residents from the West. However, unlike other geographic regions in which well-being and sleepiness were negatively related, the West coast residents reported higher well-being despite higher sleepiness.

Study limitations include a low response rate. Despite multiple reminders, 13% of respondents completed the electronic survey. The Nida et al. group report that their web-based survey was sent out to all otolaryngology residents in the US and only 190 residents responded to their survey but only 176 completed the ESS similarly showing a low response rate.²⁰ In our study, 196 residents completed the survey. Both studies report a similar response rate. There are varying response rates reported in literature for email/web based surveys, ranging from 13%²⁷ to 80%.^{28,29} With this in mind, it is important to remember how frequently residents and staff physicians receive surveys. As these survey requests add to existing burdens, it is likely that residents and staff physicians will be less likely to complete them unless there is an incentive or requirement. The survey was provided to program coordinators and

directors to transmit on to the residents, which may or may not have occurred. Technological failures are a possibility in that the residents may not have received the survey (i.e., spam filters, etc.). Because the survey was anonymous, we could not assess individual change over time or across rotations. The length of the survey was 10 minutes, which in the life of a surgical resident could mean the difference between eating or not eating. Our study assumed that the workload was similar across rotations, but this may not be the case.

A study by Sheehan in 2001 reviewed web-based surveys. The researcher noted that the American population is over-surveyed leading to lower response rates. There are responders and non-responders, due to this only the opinions of responders are heard, “resulting in a biased estimate of the characteristics of the population.” In this same study Sheehan also concludes that survey length did not affect response rate. Lastly, an “association of importance and/or timeliness with a specific topic,” or if the topic is deemed interesting, residents will likely complete the survey.³⁰ This then leads to an innate bias in the results, however, this bias cannot be changed. Given this previous research, it is possible that our results reflect a group of residents in whom burnout, mental health, quality of life, and sleepiness may have a larger impact on their lives thus they answered the questionnaire. This gives way into divulging that our results are not generalizable to the general otolaryngology resident.

As a solution to resident distress and burnout, surgical programs have instituted night float systems, day and night call times, or home call systems to increase opportunity to rest and read.³¹ These alterations run the risk of decreasing clinical and procedural experience while potentially improving professional communication.³ There have been arguments for and against these changes, some believing that the number of procedures or experiences would increase and some arguing that they would decrease.³¹ Instituting mentoring programs, dedicated research, and/or dedicated teaching times have been found to improve resident satisfaction.^{3,32} The Cedars-Sinai Psychiatry Program has implemented a program via a wellness consultant to introduce cognitive-, behavioral-, and mindfulness-based relaxation.^{3,33,34} Implementation of regular exercise programs has also been shown to reduce stress, improve self-esteem and depressed mood, leading to improvement in resident burnout.³⁵

CONCLUSION

Otolaryngology residents’ high levels of distress are associated with more sleepiness and greater hours worked. Higher stress levels are more likely to be encountered during the head and neck oncology and junior years of residency. Identifying contributing factors, including lack of control, work planning/organization,³ lack of sleep, stress, and depression during training can potentially minimize further mental distress and medical error.¹ By identifying otolaryngology residents at risk, program directors and the residents

themselves may intervene earlier when patient care or resident well-being is at risk. Identifying sources of distress creates opportunities to screen residents and provide mental and/or physical health interventions, such as education, coping strategies, or appropriate referrals. This may enhance learning and improve patient care, thus avoiding unintentional harm and medical errors.¹³

ACKNOWLEDGMENTS

Sarah Whitehouse, Editing, MS

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