An ACGME Duty Hour Compliant 3-Person Night Float System for Neurological Surgery Residency Programs

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Abstract

Background In 2003, the Accreditation Council for Graduate Medical Education (ACGME) instituted the 24+6-hour work schedule and 80-hour workweek, and in 2011, it enhanced work hour and supervision standards.

Innovation In response, Oregon Health & Science University's (OHSU) neurological surgery residency instituted a 3-person night float system.

Methods We analyzed work hour records and operative experience for 1 year before and after night float implementation in a model that shortened a combined introductory research and basic clinical neurosciences rotation from 12 to 6 months. We analyzed residents' perception of the system using a confidential survey. The ACGME 2011 work hour standards were applied to both time periods.

Results After night float implementation, the number of duty hour violations was reduced: 28-hour shift (11 versus 235), 8 hours off between shifts (2 versus 20), 80 hours per week (0 versus 17), and total violations (23 versus 275). Violations increased only for the less than 4 days off per 4-week interval rule (10 versus 3). No meaningful difference was seen in the number of operative cases performed per year at any postgraduate year (PGY) training level: PGY-2 (336 versus 351), PGY-3 (394 versus 354), PGY-4 (803 versus 802), PGY-5 (1075 versus 1040), PGY-7 (947 versus 913), and total (3555 versus 3460). Residents rated the new system favorably.

Conclusions To meet 2011 ACGME duty hour standards, the OHSU neurological surgery residency instituted a 3-person night float system. A nearly complete elimination of work hour violations did not affect overall resident operative experience.

Editor's Note: The online version of this article contains a table of detailed results from the resident survey.

Introduction

Meeting the Accreditation Council for Graduate Medical Education (ACGME) continuous clinical duty hour limits imposed in 2003 and 2011 has been particularly challenging for surgical specialties, such as neurological surgery that involves lengthy operative procedures.[1–3] Since the implementation of the duty hour limits, medical educators have initiated calls for more tailored and specialty-specific duty hour requirements, schedules, and strategies.[4] In response, various medical and surgical specialties have developed duty hour compliance systems without substantial ill effect on surgical case volume or other educational outcomes.[5,6]

To meet the 2011 ACGME standards, the Oregon Health & Science University (OHSU) neurological surgery residency program instituted a novel 3-person night float system in January 2011.[2] Here we describe the planning and implementation of this new system and analyze resident duty hour violations, number of operative cases logged, and resident acceptance of duty hour regulations for 12 months before and 12 months after institution of the new system.

Methods

Settings and Participants

The OHSU neurological surgery faculty performs approximately 3400 surgical cases per year at 3 physically interconnected hospitals (OHSU Hospital, Doernbecher Children's Hospital, and Portland Veterans Affairs Medical

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Center). During the day, the program maintains 4 separate clinical services (University A and B, Children's, and Veterans Affairs). At night, 1 in-house and 1 home call backup resident and a home call chief resident cover all 3 hospitals, which have a total average in-patient census of 50. During the time studied, the OHSU neurological surgery program was of average size, consisting of 2 residents in each year of a 7-year residency (1 preliminary clinical year, 1 year of protected research, 1 year of combined research and introductory clinical neurosciences, and 4 years of clinical neurosurgery).

Until 2010, OHSU neurological surgery postgraduate year (PGY)–2 through PGY-5 residents followed a traditional call schedule, including in-house 24-hour call every third to fourth night. In 2010, this call schedule resulted in 200 duty hour regulation violations (as measured by the July 2003 ACGME standards). Applying the July 2011 ACGME standards to 2010 work hour data would have resulted in 275 work hour violations.

What was known

Compliance with ACGME duty hour limits have been challenging for surgical specialties.

What is new

A new night float model seeks to reduce duty hour violations in a neurological surgery program.

Limitations

Single institution study limits generalizability.

Bottom line

A 3-person night float system reduced number of duty hour violations, did not negatively affect residents' case volume, and was perceived favorably by residents.

Intervention

Based on suggestions from residents and faculty, 3 scheduling strategies were proposed for enhanced ACGME compliance, including enhanced enforcement of the status quo every-third-night call, a 2-person night float, and a 3-person night float. Based on weekly and monthly workforce tables, only the 3-person night float system was fully compatible with the requirement for 14 hours off duty after a 24-hour call period, which proved the most challenging limitation.

A 3-person night float system was instituted on January 1, 2011 (FIGURE). The system incorporates both PGY-2 residents for the entire year and each of the 2 PGY-3 residents for 6 months. The 3 night float residents alternate on three 14-hour overlapping shifts for 5 consecutive days, changing shifts every 2 weeks. The overlapping shifts are timed so that 2 residents are in the hospital during the busiest times and so that there are at least 3 hours of overlap between each shift in order to provide ample time for deliberate and careful patient care handoffs, with supervision from senior residents and faculty and without delaying timely shift termination (FIGURE). Weekends are covered by a traditional 24-hour call system involving PGY-2 through PGY-4 residents on an every 14-day schedule.

The new system required dedicating half of the PGY-3 year for each of 2 residents to the 3-person night float system, shortening the existing combined introductory research and basic clinical neurosciences rotation from 12 to 6 months. Although all didactic and experiential components of neuroradiology and neuropathology fundamentals were retained in the new schedule, the time available for introductory research methods training and research rotation(s) to help identify a laboratory for full-time work in PGY-6 was curtailed.

Outcomes

We analyzed duty hour records for the 12 months before (2010) and 12 months after (2011) implementation of the 3-person night float system. Throughout the study period, duty hour were self-reported by all residents using the E*Value system (Advanced Informatics LLC, Minneapolis, MN). Program policy, requiring weekly entry of accurate duty hour data into E*Value, was distributed annually in writing to and signed by all residents and then enforced using weekly audits by the residency program coordinator and director.

The 2011 ACGME work hour regulations were applied to both time periods studied, and violations for the PGY-2, PGY-3, PGY-4, PGY-5, and PGY-7 residents were counted. The PGY-1 residents were excluded because different regulations apply to this PGY and because they are not part of the clinical rotations studied. The PGY-6 residents were excluded because they participate in laboratory research only and do not have any clinical duties (this was unaltered by the new system). The ACGME duty hour regulations used in the analysis, thus, were not actually in place for the first 18 months of the study period. Duty hour violations were calculated by the standard algorithms incorporated in the E*Value system. Although OHSU has approval for an average 88-hour workweek (10% exception), duty hours were analyzed by the standard 80-hour limit.

To assess changes in operative experience using the new system, the total number of operative cases logged in the ACGME Resident Case Log System during 2010 and 2011 for PGY-2, PGY-3, PGY-4, PGY-5, and PGY-7 residents was examined. A survey of all residents in the OHSU neurological surgery program was designed by the authors

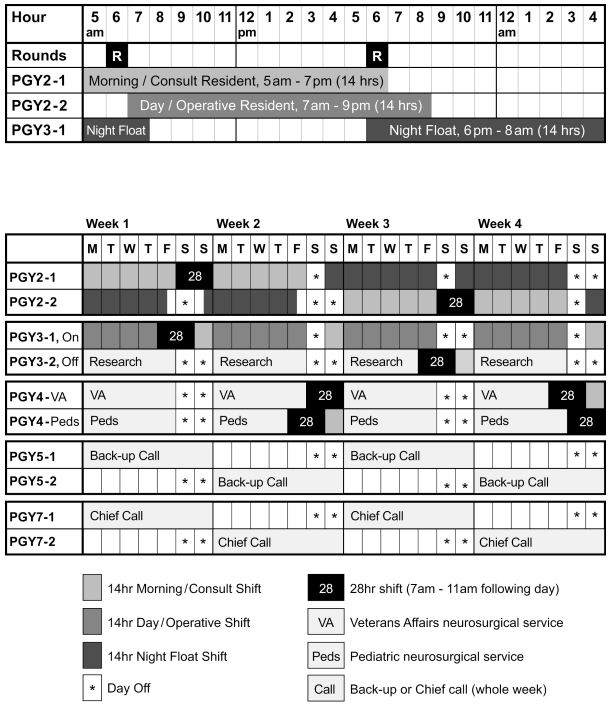

FIGURE **(Top) 3-Person Night Float System with Postgraduate Year (PGY)–2 and PGY-3 Residents. Residents Work 14-Hour Shifts (5 AM–7 PM, 7 AM–9 PM, or 7 PM–9 AM). (Bottom) Duty Shift for 3-Person Night Float System over a Complete 4-Week Cycle.**

The night float resident covers all 3 hospitals. Daily rounds with patient care handoffs occur at 6 AM and 7 PM, allowing for maximal overlap of residents.

to evaluate attitudes toward the previous traditional call schedule and new 3-person night float system (SurveyMonkey, Portland, OR).

The OHSU Institutional Review Board determined that the plan and subsequent analysis was not human subject research because the proposed activity did not meet the definition of research per 45 CFR 46.102(d).

Results

Duty Hour Violations

After implementation of the 3-person night float system, the number of all types of duty hour violations, except for the 4 days off per 4-week interval rule, dropped precipitously (TABLE 1). The few remaining violations of the continuous duty period after the intervention occurred during the first 6 months (January to June 2011) and were compliant with the 24+6 ACGME regulation in effect at that time. The 2 instances of less than 8 hours duty free between shifts after the intervention were each logged by final clinical year residents who requested and received specific, contemporaneous, and written program director exception approval within 48 hours of the shift.

Operative Caseload

The number of operative cases performed by PGY-3, PGY-5, and PGY-7 residents and the total number of resident cases increased slightly after institution of the 3-person night float system (TABLE 2). The total number of operative cases completed at the University and Doernbecher Children's hospitals, based on faculty billing records, decreased by 9% from 2010 to 2011 (3058 to 2843), suggesting that a further increase in resident caseload might otherwise have resulted from institution of the 3-person night float system.

Resident Survey

All 14 neurological surgery program residents completed the survey. Residents reported that the night float system improved operative experience and quality of life, and indicated that they would recommend it to others (detailed results are provided as online supplemental material).

Compliance

The 3-person night float system has a number of advantages for compliance with ACGME mandates. For the involved residents, a shift-based system identifies standardized and recognized hours of arrival and departure, which do not vary. Compliance is explicit, and it is easier for faculty and senior residents to recognize when a junior resident is approaching duty hour limits and should leave the hospital.

Additional Outcomes

The resident champion for creation of the 3-person night float system (M.P.) used this project to fulfill his quality improvement requirement. An ACGME site visit in June 2011 resulted in commendation of the program as an innovative duty hour system and publication of the system on the ACGME website as an "innovative educational practice," the first such notation by the Neurological Surgery Residency Review Committee.

Discussion

Institution of the OHSU neurological surgery 3-person resident night float system enhanced compliance with ACGME standards and resulted in stable to slightly increased operative experience. Residents perceived different benefits of the night float system (improved operative experience and quality of life) than those envisioned by the public and ACGME (patient safety and quality of care).[7–9] Faculty praised improved lines of responsibility and patient

TABLE 1 **Duty Hour Violations for Postgraduate Years 2, 3, 4, 5, and 7 by Quarter (Q)**[a]

	2010 Qs					2011 Qs				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
4 days off/mo, No.	0	1	2	0	3	4	2	2	2	10
>80 h/wk, No.	0	6	8	3	17	0	0	0	0	0
>24+4 h shift, No.	51	54	72	58	235	7	4	0	0	11
< 8 hours between shift, No.	9	3	6	2	20	1	0	1	0	2
Total, No.	60	64	88	63	275	12	6	3	2	23

[a] 2011 ACGME work hour regulations were applied to both time periods studied.

care handoffs, more consistent and predictable night call and daytime consult teams, and flexibility in scheduling for senior residents, who were not sent home after call. Various duty schedule strategies have been implemented in different specialties seeking to comply with regulatory standards. Internal medicine residents in a prospective crossover design study of less frequent night call versus a novel night float system experienced more sleep but fewer educational opportunities and more handovers under either modified system.[10] By contrast, replacement of a traditional call schedule model with a night float system across several studies improved duty hour compliance, reduced fatigue, and improved neuropsychological performance, although it did reduce operative experience for residents in some specialties.[11–14]

The present study could not effectively evaluate the long-term impact of reduced preliminary research exposure on written board examination scores, productivity in resident basic science publications, and other related metrics. A small proportion of the measured duty hour violations during the initial study period were in compliance with (pre-2011) ACGME regulations in effect at that time; some of these violations may therefore have been avoided had duty schedules accounted for the 2011 regulations before night float implementation. The number of observations in question does not affect confidence in the principal findings of this study.

This study also used a survey tool without evidence of validity, which raises the possibility of unintended interpretation and/or variability in responses. Although the numbers were also small, the responses did not appear to vary systematically by postgraduate year.

The concentration of night call duty in a small cohort of 3 residents allows broader participation in the daytime service by more senior residents with very little if any pressure on duty limitations by those residents. Senior residents are also freed to assume a level-appropriate supervisory role in taking backup home call.[15,16]

Conclusion

A 3-person night float system eliminated duty hour compliance problems in a 14-resident neurological surgery program with a moderate to heavy case volume. Residents and faculty embraced the system, particularly after early experience in practice. Resident case volume was maintained across PGY levels and increased at the PGY-3, PGY-5, and PGY-7 levels.

TABLE 2 **Operative Case Count for Postgraduate Years (PGYs) 2, 3, 4, 5, and 7 by Quarter (Q)**

	2010 Qs			2011 Qs		
	Q1–Q2	Q3–Q4	Total	Q1–Q2	Q3–Q4	Total
PGY-2, No.	220	131	351	193	143	336
PGY-3, No.	237	117	354	156	238	394
PGY-4, No.	375	427	802	443	360	803
PGY-5, No.	532	508	1040	506	569	1075
PGY-7, No.	357	556	913	465	482	947
Total	1721	1739	3460	1763	1792	3555

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