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Education

Work Where You Live or Live Where You Work? Resident Work and Sleep Patterns While on "Home Call"

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Background: Unlike in-house call, the Accreditation Council for Graduate Medical Education (ACGME) does not require a postcall day for "home call" shifts. Despite this, we hypothesize that on-call residents are still in the hospital for the majority of their shift despite having the luxury of home call and, thus, are not protected by ACGME postcall duty hour regulations.

Methods: A prospective single center survey study was conducted by surveying junior and senior residents who completed overnight call shifts from January 2023 to April 2023 at one of the busiest level 1 trauma centers in the United States. Data include number of trips into the hospital, hours spent in the hospital, and hours of sleep.

Results: Response rate was 195 of 200 (97.5%) total call shifts from 7 PM to 7 AM the next morning. Junior residents reported an average of 3.25, 3.92, and 0.73 hours of sleep when on hand call, face call, and triple call (hand + face + general), respectively. Senior residents reported an average of 4.18 and 4.75 hours of sleep for hand and face call, respectively.

Conclusions: Hours of sleep when taking home call varies widely based on type of call. Junior residents reported significantly decreased sleep and more time in the hospital when taking hand, face, and triple call compared with general call alone. Senior residents reported that both hand and face call result in significantly decreased hours of sleep compared with general call alone. These results highlight the need to discuss ACGME protection for residents taking home call. *(Plast Reconstr Surg Glob Open 2024; 12:e6191; doi: 10.1097/GOX.0000000000006191; Published online 13 September 2024.)*

INTRODUCTION

In 2003, the ACGME responded to increasing concerns of physician well-being and patient safety by implementing restrictions on duty hours for resident physicians.[1,2] These regulations limit clinical responsibilities to 80 hours per week and require one off-day each week when averaged over a 4-week period, with a day off defined as "one (1) continuous 24 hour period free from all administrative, clinical, and educational activities."[3] In addition, after a 24-hour in-house call, residents are required to have a postcall day, which is 14 hours free of clinical responsibilities and educational obligations.[4] After these restrictions were enacted, multiple studies have been unable to consistently demonstrate significant effects on resident education, quality of life, or patient safety.[5–9]

Residents and fellows are often required to cover overnight call throughout their training, which traditionally falls into one of two categories: "home call" or "in-house" call. Home call allows residents to remain at home until needed for consults or emergencies. This varies from traditional in-house call, where residents must physically remain in the hospital during their shifts. Due to the ambiguity between work and rest, home call has remained one of the Accreditation Council for Graduate Medical Education (ACGME)'s least regulated aspects of duty hours for residents, with only four specific regulations in place.[4]

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Although there are several studies that show that in-house call can significantly disrupt sleep, there are limited data examining work and sleep patterns of residents taking home call.[10–12] Ludvigson et al[11] noted an inverse relationship between paging volume and resident sleep while taking home call. Additionally, Chowdary et al[13] showed that residents taking stretches of home call are not able to adequately recover from sleep disruption despite adopting postcall relief days. Studies regarding the impact of home call on training or patient care outcomes is limited.[14]

Given that the vast majority of plastic surgery programs use home call to cover their services (99% of respondents in one survey),[12] more information regarding the impact of home call on patients, residents, and programs should be investigated. To address this knowledge gap, we surveyed junior and senior plastic surgery residents who completed overnight home call shifts at a level 1 trauma center. We hypothesize that despite taking home call, residents are still spending most of their shift in the hospital with length of time spent in the hospital correlating with decreased hours of sleep.

Takeaways

Question: Do residents still spend the majority of their "home call" shifts awake in the hospital without the same Accreditation Council for Graduate Medical Education requirement of postcall days following in-house call?

Findings: A prospective cohort survey study of 195 junior and senior resident call shifts showed residents still spend the majority of their overnight home call shifts awake in the hospital.

Meaning: Although home call has many benefits, more Accreditation Council for Graduate Medical Education guidance regarding postcall days may be necessary.

MATERIALS AND METHODS

Setting and Participants

The institutional review board at University of Texas at Houston approved the study as exempt from further oversight (HSC-MS-23-0137). A prospective single-center survey study of junior and senior residents who completed overnight call shifts with the plastic surgery division at Memorial Hermann Hospital in Houston, Texas from January 2023 to April 2023 was conducted. Our program consists of both integrated residents and independent fellows. Residents were asked to voluntarily and anonymously complete our survey using the Research Electronic Data Capture (REDCAP) secure data collection software. Each night, a call team consists of a junior resident (postgraduate years 1–3) and a senior resident (postgraduate years 4–8). A call shift is defined as a junior resident and a senior resident who serve as primary and secondary call, respectively. Consults are evaluated by the junior resident and discussed with the senior resident who, when needed, assists with emergency procedures or operative cases. Call shifts vary in coverage but may include general plastic surgery call, hand trauma, face trauma, or a combination of these. Overnight call always includes general plastic surgery call, which consists of new general plastic surgery consults as well as managing any floor pages for inpatient plastic surgery patients. Triple call refers to when all three are covered simultaneously (general + face + hand). Our plastic surgery division takes hand call every other week, alternating with the orthopedic department. Of note, hand call entails finger replantations, which the orthopedic department does independently. Face call is every third day, divided with the otorhinolaryngology and oral and maxillofacial surgery services. As a result, there are approximately four shifts per month when plastic surgery is on triple call. When on triple call, two senior residents are covering simultaneously—one for hand and one for face. A single junior resident is primary call and sees consults for both hand and face.

Outcomes Measured

Data collected includes number of trips into the hospital, hours physically spent in the hospital, number of consults, number of nursing/floor pages, and hours of sleep, collected via an anonymous survey from residents after completing each call shift. Respondents were asked to define overnight home call as activities between 7 PM and 7 AM and exclude all activities during their normal 7 AM to 7 PM duties.

Analysis of the Outcomes

Data were extracted from the REDCAP data collection software and compiled into an anonymous data collection sheet. These data were then categorized into junior and senior levels and by specific call shift (ie, general plastics call, hand trauma, face trauma, or a combination of these.) Data reported for hand call, face call, and triple call was compared with general call alone. *P* values were obtained using Mann-Whitney U test, defined as significant at a *P* value less than 0.05.

RESULTS

Of the 200 total call shifts, 195 (97.5%) were included. Residents were surveyed based on four different types of call shifts: general plastic surgery alone; general + hand; general + face; and general + face + hand (triple call).

Junior residents on general plastic surgery call were called into the hospital 14 out of 30 (46.7%) shifts, averaging 0.87 hours (SD 1.27) in the hospital with 6.33 hours (SD 1.08) of sleep. For hand call, they were called into the hospital 25 out of 28 (89.3%) shifts, averaging 7.07 hours (SD 4.48) in the hospital with 3.25 hours (SD 2.10) of sleep. For face call, they were called in 15 out of 16 (93.8%) shifts, averaging 6.41 hours (SD 3.76) in the hospital with 3.92 hours (SD 2.20) of sleep. For triple call, they were called in 16 out of 16 (100%) shifts, averaging 12 hours (SD 0) in the hospital with 0.73 (SD 1.14) hours of sleep (Table 1 and Figs. 1, 2).

Senior residents on general plastic surgery call were called in one out of 38 (2.6%) shifts, averaging 0.11 hours (SD 0.51) in the hospital with 6.34 hours (SD 1.07)

Table 1. Junior Resident Data for Each Call Shift Type

Junior Resident (PGY 1–3)	General Call	Hand Call	Face Call	Triple Call
Total shifts recorded	30	28	16	16
Percentage of shifts called in	46.7%	89.3%	93.8%	100%
Consults median (IQR)	0 (0–1)	4.5 (3–6)	4 (2–4.25)	9 (7–10.5)
Pages median (IQR)	3 (1–5)	7.5 (5.5–10.5)	6 (5–10)	13.5 (10–18.5)
Hours in hospital median (IQR)	0 (0–1)	7.5 (3–9)	7 (3.8–8.4)	12 (12–12)
Hours in hospital mean (SD)	0.87 (1.27)	7.07 (4.48)	6.41 (3.76)	12 (0)
	P value compared with general	<0.0001*	<0.0001*	<0.0001*
Hours of sleep mean (SD)	6.33 (1.08)	3.25 (2.10)	3.92 (2.20)	0.73 (1.14)
	P value compared with general	<0.0001*	<0.0001*	<0.0001*

*Indicates *P* value of significant difference when compared with general call.
IQR, interquartile range; PGY, postgraduate year.

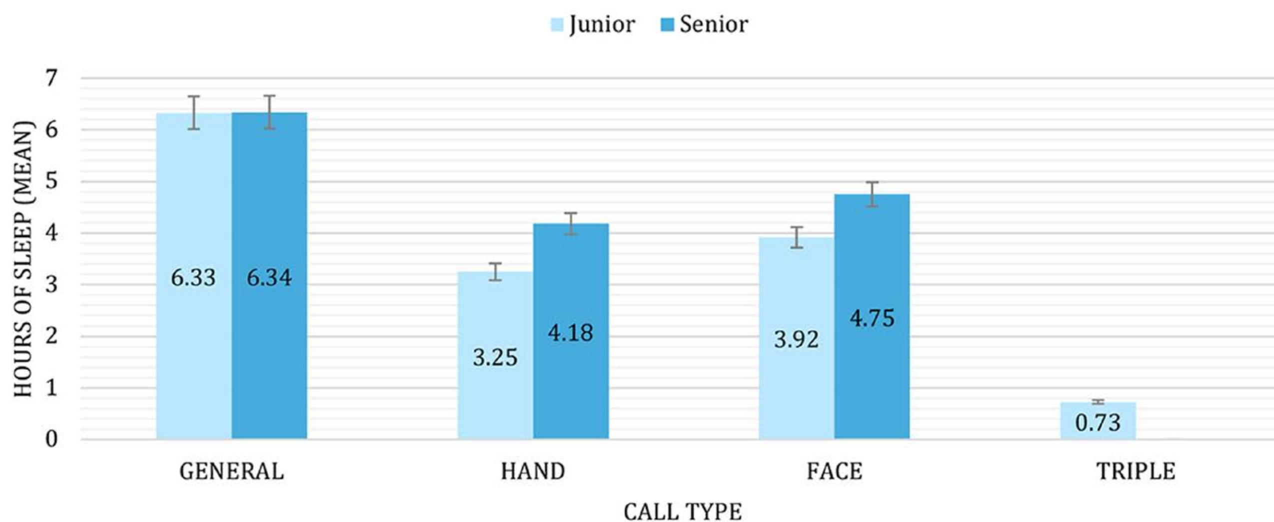

Fig. 1. Hours of sleep for juniors and seniors for each type of call shift. Each shift is from 7 PM to 7 AM. Of note, seniors are secondary call for either hand or face and are therefore not listed under triple call on this figure. Error bars represent a confidence interval of 95%.

of sleep. For hand call, they were called in 22 out of 38 (57.9%) shifts, averaging 3.72 hours (SD 4.62) in the hospital with 4.18 hours (SD 2.07) of sleep. For face call, they were called in three out of 28 (10.7%) shifts, averaging 0.3 hours (SD 1.2) in the hospital with 4.75 hours (SD 1.27) of sleep (Figs. 1, 2 and Table 2).

When comparing hand call, face call, or triple call to general call alone, juniors had significantly less sleep and spent significantly more hours in the hospital ($P < 0.00001$; Table 1). Seniors, who only cover either hand or face at a time, where found to spend significantly more time in the hospital and get significantly less sleep while on hand call ($P < 0.0001$). For face call, they got significantly less sleep ($P < 0.0001$), but hours spent in the hospital was not significantly different when compared with general call alone (Table 2).

DISCUSSION

The purpose of this study was to gain a better understanding of the workload and subsequent sleep habits of plastic surgery residents while taking home call. Although the ACGME has specific requirements for postcall days after in-house call, there is minimal emphasis on recommendations for postcall days following at-home call. The current study showed that 93 of 460 (20%) calls/pages resulted in residents returning to the hospital for a bedside evaluation, of which junior residents were more likely to return to the hospital (27%) than senior residents (18%). Of note, further calls/pages while already in the hospital do not contribute to this percentage. Junior residents were also more likely to spend the majority of their home call shift in the hospital when on hand, face, or triple call. This suggests that despite the flexible nature of home call, the workload experienced by residents is still considerable. Further studies are needed to understand surgical residents' workload while on home call to guide more specific duty hour guidelines.

Current ACGME Home Call Statement

Despite widespread implementation of home call structures, there are minimal regulations from the ACGME

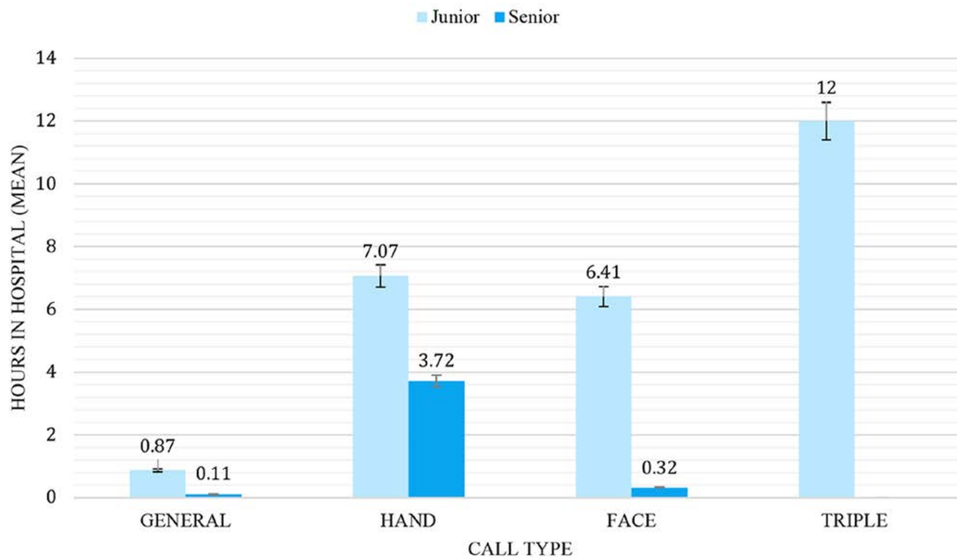

Fig. 2. Hours spent in the hospital of juniors and seniors for each call type. Each shift is from 7 PM to 7 AM. Of note, seniors are secondary call for either hand or face and are therefore not listed under triple call on this figure. Error bars represent confidence interval of 95%.

Table 2. Senior Resident Data

Senior Resident (PGY 4–8)	General Call	Hand Call	Face Call
Total shifts recorded	38	38	28
Percentage of shifts called in	2.6%	57.9%	10.7%
Hours in hospital median (IQR)	0 (0–0)	1 (0–7)	0 (0–0)
Hours in hospital mean (SD)	0.11 (0.51)	3.72 (4.62)	0.32 (1.19)
	P value compared with general	<0.0001*	0.70394
Hours of sleep mean (SD)	6.34 (1.07)	4.18 (2.07)	4.75 (1.27)
	P value compared with general	<0.0001*	<0.0001*

*Denotes *P* value of significant difference when compared with general call.
IQR, interquartile range; PGY, postgraduate year.

surrounding this "work from home" system. In addition to time spent in the hospital, home call activities such as responding to phone calls, other forms of communication, and time spent with documentation do count toward the 80-hour maximum weekly limit. Home call, however, is not subject to the every-third-night limitation seen with in-house call. Per the ACGME, home call "must not be so frequent or taxing as to preclude rest or reasonable personal time. In their evaluation of residency/fellowship programs, review committees will look at the overall impact of at-home call on resident/fellow rest and personal time."[4] It is unclear how this is specifically being assessed.

The Centers for Disease Control and Prevention and American Academy of Sleep Researchers recommends that the average adult sleeps at least 7 hours per night.[15–17] Research shows sleeping less than 7 hours for extended periods is associated with adverse health effects, including depression, obesity, hypertension, coronary artery disease, and increased all-cause mortality.[18,19] More specifically, studies assessing sleep deprivation in residents and physicians have shown that inadequate sleep negatively impacts cognitive performance and surgical technique, and increases the risk of motor vehicle accidents.[2,20–22] There are conflicting data on whether shift duration and duty hour restrictions may impact patient outcomes or the frequency of medical errors recorded by residents.[23,24] The current study demonstrates that quantity of sleep varies widely based on call type. Junior residents reported less sleep on average: 3.25, 3.92, and 0.73 hours of sleep when on hand call, face call, and triple call respectively. There is sparse literature looking at in-house call for plastic surgery residents covering trauma related shifts such as hand and face, possibly because most programs have adopted a home call model. As a potential comparison, one study by Kelly-Schuette et al[10] found that general surgery residents got significantly less sleep while covering in-house call compared with home call at 2.4 hours and 4.72, respectively. Senior residents reported slightly more sleep on average; 4.18 and 4.75 hours of sleep for hand and face call, respectively. Overall, both junior and senior residents taking home call reported amounts of sleep that met criteria for sleep deprivation.

Although prior cross-institutional studies have investigated plastic surgery resident perceptions of home call as a whole and within the context of duty hour restrictions, there have not been any published studies quantifying sleep differentiated by seniority and service coverage. A similar study by Drolet et al sent an electronic survey to 41 accredited plastic surgery programs to assess the perceived impact of home call on training and patient care. Plastic surgery residents reported that they most commonly violated duty hours after completing an overnight home call shift and continued to work through the next day (violating the ACGMEs 24 consecutive hour rule). Most residents found that home call had a positive impact on their education and quality of life, with a neutral impact on patient care.[12] Although both junior and senior residents in the current study were able to remain home across general plastic surgery call shifts, there was an expected but considerable discrepancy with shifts that included face and/or hand call. Across the entire shift sample, junior residents were effectively in-house for triple call (12 hours). We expect that these results would be comparable to other institutions covering busy level 1 trauma centers.

To combat resident fatigue while maximizing productivity, service coverage, and resident satisfaction, programs in surgical specialties have implemented several different coverage strategies utilizing home call. For example, our division offers residents a postcall day specifically following hand, face, or triple call. For general call alone, the decision for a postcall day is left to the discretion of the postcall resident, the service senior resident, and the workload the following day. A 2011 standard update by the ACGME limits first-year residents to 16-hour duty periods during which they must have direct supervision available at all times. Therefore, they are unable to take independent 24-hour call. Our postcall day policy does not apply to senior residents, who, as shown by the current study, spend less time in the hospital and obtain more sleep while on home call. The ACGME acknowledges that more senior residents and fellows must be prepared to enter unsupervised practice with "irregular and extended periods," with only "events of exceptional educational value" allowing for duty hour violations with monitoring from the program director.[4] Our protocol is not a requirement of the ACGME, but rather was put forth to protect juniors from excessive and sporadic work schedules in light of the current study. Other programs may have different postcall protocols that are more or less generous. It can also be argued that home call has more educational value, especially for senior residents, as it better reflects call as an attending surgeon.

Plastic surgery residents generally prefer home call to in-house call. However, junior residents likely perceive home call more negatively when compared with senior residents, as junior residents covering primary call are more likely to spend significant time in the hospital. This is demonstrated by the current study and others, with junior residents being more likely to be called into the hospital than senior residents.[11,12] Although taking hand, face, and triple call, junior residents spent the majority of their 12-hour home call in the hospital, averaging 7.07, 6.41, and 12 hours, respectively. Additionally, senior residents were not only called in fewer times, but also spent less time in the hospital during their home call shifts.

Home call does have its benefits, as residents are able to leave the hospital to take part in daily personal activities. The previously mentioned study by Drolet et al showed that while residents feel current home call regulations are vague, council regulation and programmatic oversight are sufficient. Even though 71.5% of residents reported that home call helps avoid strict duty hour restrictions, nearly all of respondents (92.3%) preferred home call to in-house call.[12] Home call hours logged do also apply to the 80-hour week maximum set forth by the ACGME, so there is some degree of protection for residents covering these shifts. In addition, home call adds flexible scheduling for cross-coverage of different services. This allows programs of variable sizes, call demand, and patient volume to tailor their schedules to provide adequate coverage. However, as seen in this study, home call with more demanding coverage and patient volume may place considerable burden on residents comparable to in-house call, without the protection of a required postcall day.

There are some limitations to this study, which was conducted as a single center survey study with a small sample size of junior and senior residents. Therefore, this study group may not be generalizable on a national or international scale. Memorial Hermann Hospital is also one of the busiest level 1 trauma centers in the country, which may not be representative of other programs' call requirements. Size of programs and number of residents and fellows would also affect frequency of call shifts required for coverage. The timeframe of January 2023 to April 2023 only includes four months of data, which may not be representative of call volume throughout the academic year. Residents were asked to complete the survey immediately after their shift was complete, but this may have not always been the case. As a result, recall may vary based on subjective experiences of individual residents and fellows. This study did not include factors such as commute time to the hospital or resident preference to go home when able during these shifts, which could affect sleep hours and time spent in hospital depending on resident preferences. It would be useful to assess residents' perceptions of home call compared with in-house call, specifically in the context of hand and face call, which may also vary widely based on institution. Because our residents do not take in-house call, there is no comparison group to gauge if sleep hours in the setting of hand and face call would be better or worse while in-house. Further studies across other institutions could support modifying current ACGME guidelines on home call in surgical specialties to more explicit but modular rules which take into account variability in home call demands.

CONCLUSIONS

Based on our survey results, the duty requirements and hours of sleep vary widely based on type of call. Junior residents were more likely to get minimal sleep and spend the majority of their shift in the hospital when taking

hand trauma, face trauma, or triple call when compared with general call alone. Although senior residents did not physically go into the hospital as often as junior residents, both hand and face trauma call result in significantly less sleep compared with general call alone. Further studies are needed to evaluate resident responsibilities and sleep while on home call to curate a standard ACGME protocol regarding postcall days following these shifts.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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