Emergency Medicine Resident Shift Work Preferences: A Comparison of Resident Scheduling Preferences and Recommended Schedule Design for Shift Workers

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ABSTRACT

Background: Shift work can negatively impact an individual's health, wellness, and quality of work. Optimal schedule design can mitigate some of these effects. The American College of Emergency Physicians has published schedule design guidelines to increase wellness and longevity in the field, but these guidelines are difficult to apply to emergency medicine (EM) residents given their high shift burdens and other scheduling constraints. Little is known about EM resident scheduling preferences or ideal schedule design in the context of residency training.

Objectives: The objectives were to determine whether EM resident schedule design preferences are consistent with current scheduling guidelines for shift workers and to gather information on scheduling practices that are important to residents.

Methods: We surveyed residents at four allopathic EM residency programs and assessed residents' preferences on various schedule design features including shift length, circadian scheduling, night shift scheduling, and impact of schedule design on personal wellness.

Results: Of the 144 residents surveyed, 98% of residents felt that their shift schedule was a key factor in their overall wellness. Residents agreed with shift work guidelines regarding the importance of circadian scheduling (65% favorable), although rated the ability to request a day off and have a full weekend off as more important (84 and 78% favorable responses, respectively). Recommended guidelines promote shorter shifts, but only 24% of residents preferred 8-hour shifts compared to 57, 71, and 43% of residents preferring 9-, 10-, and 12-hour shifts, respectively. Sixty-seven percent of residents preferred their nights to be scheduled in one sequence per 4-week period, a night scheduling strategy most at odds with recommended guidelines.

Conclusions: Emergency medicine resident scheduling preferences are not universally consistent with shift work guidelines, likely due to the distinct circumstances of residency training. Residents identify schedule design as a significant factor in their overall wellness.

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The authors have no relevant financial information or potential conflicts to disclose.

Author contributions: MLR—study concept and design, acquisition of the data, analysis and interpretation of the data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content; ASC—acquisition of the data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content; RT—acquisition of the data and critical revision of the manuscript for important intellectual content; CD—acquisition of the data and critical revision of the manuscript for important intellectual content; DH—study concept and design, drafting of the manuscript, and critical revision of the manuscript for important intellectual content.

Supervising Editor: Daniel P. Runde, MD.

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AEM EDUCATION AND TRAINING 2018;2:229–235

Shift work is one of the defining features of emergency medicine (EM). This holds true in academic centers and community hospitals and during residency training. Despite the many lifestyle benefits afforded by shift work, the physical and emotional toll of working irregular hours can negatively impact health, well-being, and patient care and is a significant factor in burnout and attrition from field of EM.^{1,2}

The American College of Emergency Physicians (ACEP) recently revised its recommendations for shift work with a goal of increasing the well-being of emergency physicians. Using sleep science and previous shift work literature as a base, these recommendations provide discrete shift schedule design strategies to help mitigate the negative effects of shift work on emergency physicians. Specific recommendations include the following: clockwise shift rotation (day to evening to night), avoidance of overly long shifts and inordinately long stretches of shifts, and scheduling either isolated night shifts or long sequences of several weeks of night shifts at a time.^{3,4}

Although these recommendations may be ideal for attending physicians, EM residents represent a unique cohort of shift workers with a distinct set of scheduling requirements and constraints. High shift burdens, duty hour regulations, required educational conferences, and varying rotations in and out of the emergency department (ED) make these recommendations extremely difficult to implement, and it is unknown whether such recommendations should be prioritized when designing resident schedules. Prior studies have described resident shift lengths and types, resident shift tolerance, and morningness-eveningness preference.^{5,6} However, little is known about best practice in schedule design for EM residents, resident scheduling preferences, or how resident preferences compare to the current shift work guidelines.

The primary objective of our study was to determine if EM resident shift scheduling preferences are consistent with the recommended scheduling guidelines for shift workers. Our secondary objective was to gather information on additional scheduling practices that are important to residents and may improve their well-being.

METHODS

Study Design

This was a multi-institutional, cross-sectional study using online and paper surveys. Participation was

voluntary and anonymous. The survey was declared exempt by the Hennepin County Medical Center Institutional Review Board.

Study Setting and Participants

Emergency medicine residents from four allopathic residency programs were eligible to complete the survey. Sites included Hennepin County Medical Center (HCMC) in Minneapolis, Minnesota; Los Angeles County + University of Southern California Medical Center (LAC-USC) in Los Angeles, California; University of Kentucky Healthcare (UKY) in Lexington, Kentucky; and Mount Sinai Health System (MSH) in New York, New York. The survey was distributed to participants in June 2017 using an online platform. Paper surveys were also brought to departmental educational sessions to collect responses from EM residents who had not yet filled out the online questionnaire. Given that this survey was distributed at the end of the academic year, all residents had completed at least 11 months of residency training prior to completing the survey. Residents were not briefed on shift design strategies for shift workers or ACEP shift design recommendations prior to filling out the survey.

Survey Development

Preliminary survey questions were developed by the principal investigator (MLR) and subsequently reviewed and modified by four EM educators and researchers to ensure content validity. A medical education research specialist and an emergency physician with specialized training in survey design then reviewed the survey and provided guidance on the survey structure. Following this, a representative sample of 10 EM residents reviewed the modified survey questions to ensure the survey items were clear and interpretable to establish response process validity. Suggested minor changes were made to increase clarity of the items with subsequent review by the investigative team.⁷ Specific information regarding current scheduling practices at each site was collected from a primary scheduler (i.e., either chief resident or the faculty member) at each program.

Data Analysis

All data were analyzed descriptively, using medians, interquartile ranges, and proportions when appropriate. Univariate analysis for various factors was performed using chi-square analysis. A *p* value of <0.05

was set as significant. Analyses were performed by STATA software version 15 (StataCorp).

RESULTS

Respondents

In total, 144 of 202 eligible residents completed this survey for an overall response rate of 71%. Specific site response rates were as follows: 41 of 45 eligible residents at HCMC (91%), 48 of 68 residents at LAC-USC (71%), 23 of 29 residents at UKY (79%), and 32 of 60 residents at MSH (53%). All completed surveys contained usable data.

Demographic characteristics of the respondents are presented in Table 1. The sex and age distribution was similar to that reported for all EM residents in Accreditation Council for Graduate Medical Education (ACGME)-accredited EM programs.⁸

Current Scheduling Practices

Current scheduling practices at the participating programs are depicted in Table 2. As seen in prior studies, there was significant variation in scheduling practices among the participating programs, but all participating programs complied with ACGME duty hour requirements when creating their resident schedules.⁹

Table 1
Demographics

Characteristic	n = 144
Age (years)	30 (26–45)
Sex	
Male	87 (60.4)
Female	57 (39.6)
Living with significant other	97 (67.4)
Kids at home	21 (14.6)
Current residency	
HCMC	41 (28.5)
LAC-USC	48 (33.3)
UKY	23 (16.0)
MSH	32 (22.2)
PGY	
PGY-1	38 (26.4)
PGY-2	43 (29.9)
PGY-3	38 (26.4)
PGY-4 or higher	25 (17.3)

Data are reported as median (IQR, total range) or *n* (%). HCMC = Hennepin County Medical Center; IQR = interquartile range; LAC-USC = Los Angeles County + University of Southern California Medical Center; MSH = Mount Sinai Health System; UKY = University of Kentucky Healthcare.

Shift Length

Residents were asked to rate the desirability of working various shift lengths to achieve a 48-hour work week on a 4-week EM rotation. This work week is similar to the average work week of EM residents.⁹ The results are depicted in Figure 1. Given a constant number of total hours worked over a 4-week time period, more residents indicated a preference for working 10-hour shifts compared to 8-, 9-, or 12-hour shifts. Residents felt most negatively about a schedule of twenty-four 8-hour shifts. As depicted in Figure 1, there was some variability in preferences of residents in different years of training, with a significant difference detected in the desirability of the 9-hour shift schedule ($p = 0.049$). There were no significant differences between residency levels in regard to the 8-, 10-, or 12-hour shift schedules ($p = 0.56$, $p = 0.65$, and $p = 0.45$, respectively). Residents were split on the desirability of 12-hour shifts, with approximately half of residents seeing them as desirable and half seeing them as undesirable. Residents at programs who currently work 12-hour shifts were more likely to see 12-hour shifts as desirable compared to programs that do not work 12-hour shifts ($p = 0.0001$).

Night Shift Scheduling

One of the four EM programs in the study scheduled residents for 2-week blocks of nights. At the remaining residency sites, residents worked four to 10 overnight shifts in one to two sequences while on a 4-week EM rotation. Nearly three-quarters of residents (72%) reported that they tolerated night shifts fairly or very well. Compared to the general study population, there was no significant difference in the ability to tolerate night shifts among residents with a significant other at home, children at home, or over the age of 35 ($p = 0.88$, $p = 0.59$, and $p = 0.39$, respectively).

When presented with a scenario in which they were required to work six night shifts over a 4-week block, residents indicated a preference for working either one sequence of six nights (67%) or two sequences of three nights (65%). Very few residents desired working individual or paired night shifts in this scenario (6 and 17% favorable responses, respectively). Residents were split on the concept of “night EM blocks,” with an equal number of residents rating this as desirable and undesirable. Residents in programs who worked night EM blocks did not feel night blocks were more desirable than residents in program who do not use this night scheduling method ($p = 0.39$). There was

Table 2
Current Scheduling Practices

	HCMC	LAC-USC	UKY	MSH
Shift lengths	Mix of 8-, 9-, and 10-h	Mix of 8-, 9-, 10-, and 12-h	Mix of 9- and 10-h	Mix of 8-, 10-, and 12-h
No. of night shifts/4 weeks	5–6	N/A (work independent night EM blocks)	5	4–10
Night shift scheduling method	1–2 sequences*	2-week night EM blocks	1–2 sequences*	1–2 sequences*

HCMC = Hennepin County Medical Center; LAC-USC = Los Angeles County + University of Southern California Medical Center; MSH = Mount Sinai Health System; UKY = University of Kentucky Healthcare.

*A sequence indicates a set of night shifts occurring in tandem.

Figure 1. Resident shift length preferences given a scenario of a 48-hour work week on a 4-week EM rotation.

no significant difference between preferred method of night shift scheduling in residents with children at home compared to the entire study population ($p = 0.75$).

The results broken down by postgraduate year can be seen in Figure 2. Of note, although working one sequence of six nights was the favored method of

night shift scheduling, it declined in popularity as residents progressed further into residency. Eighty-two percent of PGY-1, 70% PGY-2, and 56% PGY-3+ residents rated this as a desirable night shift scheduling strategy ($p = 0.02$). Upper-level residents (PGY3+) most preferred a night shift schedule of two sequences of three nights each, with 74% rating this as desirable.

Figure 2. Resident night shift scheduling preferences for completion of 6 nights per 4-week EM rotation.

There were no other significant differences between residency years.

Other Scheduling Preferences and Wellness

Seventy-three percent of respondents (105/144) preferred working longer stretches of shifts followed by several days off in a row rather than working shorter stretches with single days off in between. When asked to rate the importance of various scheduling features, the ability to request a single day off per rotation was felt to be important by the largest number of residents (121/144, 84%) followed closely by having a full weekend off during a 4-week block (112/144, 78%). Clockwise shift rotation and being well rested for educational conferences were also felt to be important by a majority of residents, but by lower margins (65 and 63%, respectively). Ninety-eight percent (141/144) of residents felt that their shift schedule was a key factor in their overall wellness while on an EM rotation.

DISCUSSION

Our results show that the scheduling preferences of EM residents only partially align with current shift work guidelines. Residents generally agree with the principle of clockwise shift rotation, but rate other scheduling factors as more important. When given scenarios that account for residency shift burdens, residents' shift length preferences, night shift scheduling preferences, and their desire for longer shift stretches are at odds with the recommended guidelines. Additionally, in comparison to prior studies on the topic, we found differences in preferred shift length and the influence of other factors such as children in the home.

Clockwise Shift Rotation

Prior studies suggest that predictable clockwise shift rotation was used by only 40% of EM residences.¹⁰ In our study, two-thirds of residents agreed with current ACEP shift work guidelines on the importance of clockwise shift rotation. However this was not residents' top scheduling priority. Residents rated the ability to request a specific day off and have a full weekend away from work as more important than clockwise shift rotation. Time away from work for social purposes has been associated with increased resident well-being.¹¹ Our data suggests that the ability to request specific days off or have a full weekend off should strongly be considered in EM resident

schedule design, and that these considerations could potentially have a larger impact on resident well-being than clockwise shift rotation.

Shift Length

Shorter shifts are recommended by shift work guidelines, as they allow for more gradual circadian adjustments in individuals with a rotating shift schedule. Additionally, physician productivity has been shown to decline over the course of a shift, and quality of care may also be impacted.^{4,12} A prior study of EM residents on the topic of shift length showed that shorter shifts (i.e., 8- and 10-hour shifts) were more preferred by residents compared to 12-hour shifts, even if it meant fewer days off.⁵ Our study did not support these findings. Given a proposed 48-hour work week, residents had the least favorable reaction to a schedule of 8-hour shifts, likely because this schedule resulted in only 4 days off per 4 weeks. As current EM residents work an average of 45.5 hours per week, 8-hour shifts would likely be an undesirable scheduling strategy for most residency programs.⁹ Nine- and 10-hour shifts were the most favored, possibly because they offer a balance of both shorter shifts and more days off. Nearly half of residents found 12-hour shifts desirable, but this was much more likely if the resident had experience with working 12-hour shifts. This could be due to differences in patient volume, acuity, or staffing models at different hospitals, making 12-hour shifts more or less feasible. This may also be due to normalization of 12-hour shifts for residents who currently work them or general resistance to change, although this has not been seen in prior studies.⁵

Night Shifts

As seen in previous studies, EM residents in our study work large numbers of night shifts but report tolerating these night shifts well.^{5,10} Shift work guidelines recommend night shifts be scheduled either in isolation or in "night blocks" where an individual works several weeks of night shifts at a time. In our study, working isolated overnights was not a favorable method of scheduling night shifts, likely because the large number of night shifts required in residency training make this impractical. Scheduling long sequences of nights into night blocks was rated as more desirable than isolated night shifts, but still not as desirable as other night shift scheduling methods. Resistance to night blocks may be due to fear of social isolation during these periods, a known risk of this scheduling method.⁴ Prior

literature has shown that resident well-being is positively associated with time to nurture aspects of one's personal life and spend time with family and friends.¹³ If prolonged or frequent night blocks are required to fulfill residents' night shift requirements, programs should closely monitor whether the sleep and circadian benefits outweigh any negative impact on resident well-being during these periods.

In our study, the most desirable method of scheduling night shifts was in a single sequence of six night shifts during each ED rotation. Interestingly, this method of scheduling is seen as the worst strategy for scheduling night shifts according to circadian principles.¹ Upper-level residents did find this strategy less desirable than residents early in training. Instead, upper-level residents favored a strategy of scheduling two sequences of three nights per rotation, which is also not in line with night scheduling recommendations. Considering the findings, it is our hypothesis that given the large numbers of night shifts required in residency training, residents prefer a strategy that both limits the number of circadian adjustments a resident must make while also avoiding prolonged periods of social isolation.

As seen in prior studies, the EM residencies in our study do not consistently employ recommended night shift scheduling strategies.⁵ This may be due to resident preferences as described above. Only one residency program involved in the study employs a night-scheduling method currently recommended by shift work guidelines and does so by scheduling 2-week night blocks rather than interspersing them on a normal EM rotation. The residents in this residency did not feel more favorably about night blocks than other residents in the study.

Length of Shift Sequences

Although guidelines recommend avoiding long shift sequences, residents in our study preferred longer stretches of shifts followed by multiple days off together rather than shorter sequences with single days off. These results may indicate that given the high shift burdens and paucity of free time during residency training, residents feel they need multiple days off at a time in order to fully pursue other priorities, such as family, friends, and travel, all of which have been associated with increased resident well-being.¹³ Alternatively, these results may indicate that residents better tolerate long sequences of shifts, although further study is needed on this topic.

Other Factors

Prior studies have found that younger age and lack of children at home are positively correlated with the ability to tolerate shift work.⁶ Our study did not demonstrate these findings. In addition, having a significant other or children at home did not significantly impact night scheduling preferences.

The variability of shift schedules worked by residents participating in our study demonstrates that there is no clear standard by which residents are scheduled. Despite this, nearly all residents surveyed felt that their shift schedule was a key factor in their overall wellness while on an EM rotation, making this an important topic for further consideration going forward.

LIMITATIONS

Our data are subject to some limitations. First, all preferences are self-reported and not based on actual trials of various shift schedules in the ED. However, common preferences did emerge despite participating programs having substantial variability in their scheduling practices, with notable exceptions reported above. Additionally, while this study included four EM residency programs in different geographic locations with distinct schedule design practices, the sample size is relatively small. A future study involving a larger cohort of EM residents could further validate the findings and define additional trends that will of use in identifying best practice in EM resident schedule design.

Finally, we have yet to determine whether scheduling based on these preferences translates into increased wellness or improved performance outcomes for EM residents. The residents in the program who worked the highest number of night shifts had the lowest overall response rate for our survey. Whether these residents had decreased wellness or higher burnout rates compared to the other residents is unknown. Given that residents identify schedule design as an important factor in wellness, further studies comparing resident wellness and burnout data to various schedule designs is an important future step.

CONCLUSIONS

Emergency medicine resident scheduling preferences are not universally consistent with current shift work guidelines, likely due to the distinct circumstances and constraints present in residency training. However,

nearly all residents surveyed felt that their shift schedule was a key factor in their overall wellness while on an EM rotation, making this an important topic going forward. Future directions include validating these findings with a larger cohort and determining whether scheduling according to these preferences translates into increased wellness or improved performance and patient care outcomes for EM residents. In the interim, EM residency program leadership should recognize the unique attributes of shift work during EM residency and invite an ongoing dialogue with their residents on schedule design strategies that may increase wellness during residency training.

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