

The Perceived Effect of Duty Hour Restrictions on Learning Opportunities in the Intensive Care Unit

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Abstract

Background Many countries have reduced resident duty hours in an effort to promote patient safety and enhance resident quality of life. There are concerns that reducing duty hours may impact residents' learning opportunities.

Objectives We (1) evaluated residents' perceptions of their current learning opportunities in a context of reduced duty hours, and (2) explored the perceived change in resident learning opportunities after call length was reduced from 24 continuous hours to 16 hours.

Methods We conducted an anonymous, cross-sectional online survey of 240 first-, second-, and third-year residents rotating through 3 McGill University-affiliated intensive care units (ICUs) in Montreal, Quebec, Canada, between July 1, 2012, and June 30, 2013. The survey investigated residents' perceptions of learning opportunities in both the 24-hour and 16-hour systems.

Results Of 240 residents, 168 (70%) completed the survey. Of these residents, 63 (38%) had been exposed to both 24-hour and 16-hour call schedules. The majority of respondents (83%) reported that didactic teaching sessions held by ICU staff physicians were useful. However, of the residents trained in both approaches to overnight call, 44% reported a reduction in learner attendance at didactic teaching sessions, 48% reported a reduction in attendance at midday hospital rounds, and 40% reported a perceived reduction in self-directed reading after the implementation of the new call schedule.

Conclusions A substantial proportion of residents perceived a reduction in the attendance of instructor-directed and self-directed reading after the implementation of a 16-hour call schedule in the ICU.

Editor's Note: The online version of this article contains the survey instrument used in this study.

Introduction

A number of countries across the globe have reduced duty hours for resident physicians to address concerns about

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Funding: The study was funded by the Canadian Society of Internal Medicine through its Education and Research Fund Grant.

Conflict of interest: The authors declare they have no competing interests.

This study was presented as a poster at the Canadian Society of Internal Medicine, on October 4, 2013, in Toronto, Ontario, Canada.

The authors would like to thank the Departments of Medical Education and Internal Medicine at McGill University.

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Received March 11, 2014; revision received August 29, 2014; accepted October 20, 2014.

DOI: <http://dx.doi.org/10.4300/JGME-D-14-00180.1>

patient safety and resident quality of life.¹⁻³ Research found that after being “on-call” the preceding night, surgical residents made twice the number of technical errors during simulated laparoscopic surgical procedures compared with residents who slept overnight.⁴ Furthermore, in the intensive care unit (ICU), residents working in the traditional 24-hour call duty system made 35% more medical errors than those working a 14-hour overnight shift.¹

Although the reduction of resident duty hours may decrease medical errors in the ICU,¹ the effect on resident learning is unclear. Several studies⁵⁻¹⁶ have evaluated the impact of reduced duty hours on learning in surgical, pediatric, and internal medicine environments. However, there are no published studies that have evaluated its impact on learning in ICU settings where knowledge and procedural skills requirements are different.

In Quebec, the residents' collective work agreement has set more restrictive duty hour limits.¹⁷ The agreement, established in July 2012, limits the in-hospital shift length to 16 continuous hours. In the United States, only first-year residents are limited to a continuous duty period of 16 hours.¹⁸ The change of duty hours in Quebec provided

an opportunity to study residents' perceptions of learning opportunities by comparing the new 16-hour call schedule to the previous 24-hour duty hour system.

Methods

We conducted a cross-sectional survey of 240 first-, second-, and third-year residents rotating through 3 McGill University hospital network adult ICUs between July 1, 2012, and June 30, 2013.

Survey Development

Since there are no surveys in the literature that specifically address learning opportunities for trainees in the ICU setting, we constructed our survey from a literature review and discussions with local ICU physicians and residents. The survey was piloted with a group of fourth-year internal medicine residents to minimize ambiguity and repetition. Modifications were made from their feedback. The final survey consisted of 29 questions divided into 2 sections (provided as online supplemental material). All participating residents completed the first section, and only residents who have worked in both the old and new duty hour schedules completed the second section.

In the first section of the survey, we collected data on residents' perceptions of their current learning opportunities. This included information about the opportunity to perform common ICU procedures, attendance at formal teaching sessions, time spent in self-directed reading, and the usefulness of teaching during clinical supervision. Responses used a 4-point Likert scale.

The second part of the survey compared residents' perceptions of learning opportunities in the new 16-hour schedule and the traditional 24-hour call schedule by using a 5-point Likert scale (from 1, a significant reduction, to 5, a significant increase in learning opportunities). The domains evaluated were residents' opportunities to (1) place central and arterial lines, and perform intubations; (2) attend sign-in and sign-out rounds; (3) attend midday hospital rounds and didactic teaching sessions; (4) read about critical care; and (5) autonomously assess critically ill patients. The last question asked for narrative comments about the change in learning opportunities since the implementation of the 16-hour duty hour system.

The survey was distributed electronically using our online system. Residents were sent an e-mail explaining our study and its objective before survey distribution. Surveys were completed on a voluntary basis, and the data collection process was anonymous.

The survey underwent peer review at the McGill Centre for Medical Education and was approved by the McGill University Institutional Review Board.

What was known and gap

New models seek to address patient safety and resident well-being concerns resulting from 24-hour overnight call.

What is new

After a change from 24-hour to 16-hour intensive care unit (ICU) shifts, a proportion of residents reported reductions in opportunities for didactic and procedural learning.

Limitations

Single specialty, single institution study, and potential sampling bias reduce generalizability.

Bottom line

Residents did not perceive an improvement in didactic and procedural learning opportunities after a change from a 24-hour to a 16-hour ICU shift.

Statistical Analysis

Descriptive statistics were used to describe the distribution of residents, based on resident level and residency training program. Nominal exposure variables, including the number of ICU months completed, procedures attempted per month (central lines, arterial lines, and intubations), and hours of independent reading per week, were compared across training levels by using χ^2 tests based on their medians. One-way analysis of variance was used to compare first-, second-, and third-year residents, and was based on the average number of midday hospital rounds and didactic teaching sessions attended per week.

Likert scale responses regarding the usefulness of learning opportunities were categorized into 2 groups: not useful and useful. Chi-square analysis was used for this new dichotomous variable. For residents who had experienced both systems, the Likert scale for the perception of change in learning opportunities was collapsed into 3 groups: a reduction, no change, and an improvement in the new duty hour system.

All statistical analysis was conducted using SPSS Statistics version 20 (IBM Corp). Data from the narrative question were examined for recurring themes.

Results

The overall response rate was 70% (168 of 240). The response rate was 74% (36 of 49) for third-year residents, 67% (51 of 76) for second-year residents, and 65% (75 of 115) for first-year residents, and the distribution of respondents across specialties reflected the distribution of residents in general (TABLE 1). Third-year residents were perceived to have the most opportunities to place central and arterial lines, and first-year residents had the fewest ($P > .99$ and $P = .01$, respectively). The majority of third-year residents reported that sign-in rounds (83%) and didactic

TABLE 1 RESPONDING RESIDENTS' CHARACTERISTICS ^a	
	n (%)
Residents trained in both the 24-h and the 16-h model	63 (38)
Resident level	
First-year	75 (45)
Second-year	51 (30)
Third-year	36 (21)
Unknown	6 (4)
Residency training program	
Internal medicine	77 (46)
Surgery	24 (14)
Anesthesiology	11 (6)
Emergency medicine	14 (8)
Family medicine	15 (9)
Other	24 (14)

^a Distribution of participating residents based on residency year and training program.

teaching sessions (83%) led by ICU attending physicians were useful (TABLE 2). In contrast, a lower percentage of third-year residents perceived sign-out rounds (50%) and midday rounds (47%) as useful. Anesthesiology residents perceived their learning opportunities during procedural skills to be less useful when compared to residents in other programs ($P = .002$ for central lines, $P = .02$ for arterial lines, and $P = .004$ for intubations).

The majority of residents trained in both duty hour models were second- and third-year residents. This represented 49% (31 of 63) for third-year residents, 40% (25 of 63) for second-year residents, and 11% (7 of 63) for first-year residents. A substantial portion of this group perceived a reduction in their opportunity to attend didactic teaching sessions (44%), independently read about critical care (40%), and attend midday hospital rounds (48%; TABLE 3).

While most residents perceived no change in their exposure to procedural skills, a segment reported a reduction in opportunities for central line placement (21%), arterial line placement (21%), and intubation (19%); and 40% perceived a reduction in opportunities to read about critical care outside of work hours.

Across all residency training programs, few residents perceived a reduction in learning opportunities during review of ICU consults, admissions, autonomous assessment of critically ill patients, or sign-in rounds (TABLE 3). Few residents reported any improvement in learning opportunities. The exception were attending sign-in rounds (25%), and autonomously assessing critically ill patients (22%).

In the narrative responses, recurring themes included reduced self-directed reading, reduced didactic teaching sessions, and reduced midday hospital round attendance. These findings were consistent with our quantitative results. Residents perceived these reductions more strongly during their week of night shifts. Residents stated there was “less time for independent learning,” “less [teaching] sessions organized because [of a] short-staffed team busy with patients,” and “missed teaching sessions because of night calls,” and that “it was frustrating for me as the

TABLE 2 PERCEIVED USEFULNESS OF LEARNING OPPORTUNITIES BASED ON RESIDENCY LEVEL				
Residents who perceived that their learning opportunities were useful				
	Resident Level, n (%)			P
	First-Year, 75 (45)	Second-Year, 51 (30)	Third-Year, 36 (21)	
Sign-in rounds	64 (86)	37 (72)	30 (83)	.14
Sign-out rounds	49 (66)	24 (47)	18 (50)	.07
Didactic teaching sessions	59 (81)	44 (86)	30 (83)	.73
Midday hospital rounds	42 (59)	26 (55)	16 (47)	.51
Placing central line	62 (85)	41 (85)	18 (51)	> .99
Placing arterial line	56 (78)	37 (76)	17 (50)	.01
Performing intubation	51 (74)	31 (67)	21 (60)	.34
Completing an admission or consultation	53 (74)	37 (72)	24 (69)	.86

TABLE 3 PERCEIVED CHANGE IN LEARNING OPPORTUNITIES SINCE IMPLEMENTATION OF 16-HOUR SYSTEM FOR RESIDENTS EXPOSED TO BOTH SYSTEMS

Residents' reported changes in learning opportunities since the transition to the 16-hour system. Participating residents were trained in both systems.

	Residents Trained in Both Systems, n (%)		
	Improvement	No Change	Reduction
Attend sign-in rounds	16 (25)	40 (64)	7 (11)
Attend sign-out rounds	4 (6)	33 (53)	25 (40)
Attend critical care didactic teaching sessions	11 (18)	24 (38)	28 (44)
Attend midday hospital rounds	4 (6)	28 (45)	30 (48)
Complete ICU consults	8 (13)	49 (78)	6 (10)
Autonomously assess critically ill patients	14 (22)	41 (65)	8 (13)
Place central lines	5 (8)	45 (71)	13 (21)
Place arterial lines	6 (10)	44 (70)	13 (21)
Perform intubation	5 (8)	46 (73)	12 (19)
Read about critical care outside of working hours	8 (13)	30 (48)	25 (40)

Abbreviation: ICU, intensive care unit.

overnight resident because I would miss a lot of daytime teaching.”

Discussion

Following the institution of a 16-hour limit on on-call hours in the ICUs at McGill University, a substantial proportion of residents, who had trained under both a 24-hour limit and the new 16-hour limit, perceived a reduction in several learning opportunities, most notably in physician-led didactic teaching sessions and attendance to midday hospital rounds. Despite the reduction in duty hours, a sizable percentage of residents perceived a reduction in self-directed reading. Outside of sign-in rounds and the opportunity to autonomously assess critically ill patients, few residents perceived any improvements in learning opportunities, and the majority reported a reduction or no change in procedural and didactic learning under the new duty hours.

Despite reduced learning opportunities, both junior and senior residents valued their learning opportunities, particularly didactic teaching sessions and morning sign-in rounds (TABLE 2). This is consistent with literature from internal medicine residency training programs that have adopted a night float system,^{7,12,13,15} where residents work several consecutive night shifts during their rotations.

The reduction in didactic teaching may reflect reduced faculty availability. Previously, a full team would be

available during the daytime. Medical teams now have 50% to 60% less staffing but a similar workload. Consequently, staff physicians have less time to teach, and fewer residents to receive it.¹⁹ Solutions could include instituting didactic teaching before morning sign-in rounds where both daytime and night float residents overlap, or having an attending teaching presence during the night shift.

Our study has limitations. It used a convenience sample and assessed resident perceptions, which are subject to recall bias. We were not able to separate perceptions about the educational value of didactic and procedural training as individual progress through training from perceptions about the impact of the change in the duty hour model. Finally, we did not assess the impact of reduced learning opportunities on educational outcomes or the quality of patient care. Further studies are needed to establish how resident clinical performance and knowledge have been affected by the schedule change.

Our study also has several strengths. We were able to obtain a 70% response rate and recruit a cohort of residents that was representative of all residents rotating through the 3 McGill University-affiliated ICUs. This allows the results to be generalizable to other critical care training settings.

Conclusion

The reduction in duty hours has led to a reported decrease in didactic teaching sessions, self-directed reading, and

attendance to midday hospital rounds. Changes should be considered to the current teaching methods and schedules to mitigate the impact of restricted duty hours on residents' learning. Future studies are also needed to evaluate the change in resident clinical performance and critical care knowledge in the era of reduced duty hours.

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