

# Fatigue in Residency Education: Understanding the Influence of Work Hours Regulations in Europe

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## Abstract

### Purpose

Although one proposed solution to the problem of fatigued medical trainees is the implementation of work hours regulations, concerns about the effectiveness of these regulations are growing. Canada remains one of the few Western jurisdictions without legislated regulation. Recent research suggests that fatigue is a complex social construct, rather than simply a lack of sleep; thus, the authors explored how regulations and fatigue are understood in countries with established work hours frameworks to better inform other jurisdictions looking to address trainee fatigue.

### Method

Using constructivist grounded theory methodology, the authors conducted

individual, semistructured interviews in 2015–2016 with 13 postgraduate medical trainees from four European countries with established work hours regulations. Data collection and analysis proceeded iteratively, and the authors used a constant comparative approach to analysis.

### Results

Trainees reported that they were commonly fatigued and that they violated the work hours restrictions for various reasons, including educational pursuits. Although they understood the regulations were legislated specifically to ensure safe patient care and optimize trainee well-being, they also described implicit meanings (e.g., monitoring

for trainee efficiency) and unintended consequences (e.g., losing a sense of vocation).

### Conclusions

Work hours regulations carry multiple, conflicting meanings for trainees that are captured by three predominant rhetorics: the rhetoric of patient safety, of well-being, and of efficiency. Tensions within each of those rhetorics reveal that managing fatigue within clinical training environments is complex. These findings suggest that straightforward solutions are unlikely to solve the problem of fatigue, assure patient safety, and improve trainee well-being.

Long working hours have been a longstanding tradition within postgraduate medical education across many contexts; however, extended periods of sleep deprivation from working long shifts lead to fatigue-related impairment.<sup>1–3</sup> As a result, in many jurisdictions, efforts to address the problem of fatigued medical trainees have focused on restricting trainee work hours. To illustrate, in the United States in 2011, the Accreditation Council for Graduate Medical Education restricted continuous duty periods to 16 hours within a maximum 80-hour workweek.<sup>4</sup> Still, duty hours reforms have

remained controversial there and in other contexts with regulations.

Some jurisdictions, including Canada, lack national legislated work hours for trainees. Researchers continue to question the merits of restricting duty hours amid concerns that reduced work hours compromise training<sup>4,5</sup> and reduce “clinical commitment.”<sup>6(p861)</sup> Some research, however, has suggested that Europe has resolved the issue of doctors’ hours with the implementation of the European Working Time Directive (EWTD), which restricts shifts to 13 hours with a maximum 48-hour workweek.<sup>7</sup>

In 1998, the Council of Europe instituted the EWTD to “protect the health and safety of all workers in the European Union.”<sup>8(p1)</sup> Medical trainees were initially exempt from the regulations<sup>8(p1)</sup>; however, by 2009, all medical training programs were expected to have implemented EWTD-compliant call schedules or rotas. Critics of the EWTD suggest that it has not improved patient care or optimized training.<sup>9–11</sup> The empirical data in these regards are conflicting.

Cappuccio and colleagues<sup>12</sup> demonstrated that an EWTD-compliant rota could reduce medical errors in non-procedural-based specialties. The authors acknowledged, however, that their study was not intended to assess the educational impact of a 48-hour workweek.<sup>12</sup> Another set of authors conducted a survey of surgical trainees and attending physicians, which revealed predominantly negative perceptions of the EWTD—despite the authors’ acknowledgment that “the benefits to lay people appear self evident.”<sup>13(p296)</sup> In another study, three cohorts of medical graduates from the United Kingdom offered their opinions of the EWTD and questioned whether it was truly in the best interest of trainees.<sup>14</sup> The conflicting literature suggests that no simple solutions will resolve a problem as complex as trainee fatigue and working hours.

Our understanding of fatigue in medical trainees has expanded from seeing it as merely an emotional or physical state, to also considering it to be a social construct.<sup>15</sup> A social construct emerges as like-minded individuals attempt to make sense of a shared experience; over

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time, these constructs are transmitted and reinforced throughout the culture and eventually rendered as accepted truths.<sup>16</sup> For example, previous research from Canada suggests that postgraduate medical trainees conceptualize fatigue as a personal challenge they must overcome rather than an occupational hazard.<sup>17</sup> The idea of fatigue as a social construct has implications for work hours reform because it calls attention to the social context in which trainees are embedded. As medical educators continue to debate the merits and impact of work hours reform in the United States and Canada,<sup>4,17,18</sup> considering what we can learn from the European experience, given the different social context, is worthwhile. Existing research related to the EWTD has tended to focus on the experiences of trainees within a single specialty,<sup>12,13,19</sup> and many studies are confined to a single setting.<sup>14,20,21</sup> Here we sought to explore how trainees—across multiple training programs and within jurisdictions at varying stages of implementing the EWTD—understand these regulations and their relevance to the problem of trainee fatigue.

## Method

We used a constructivist grounded theory approach to qualitative research because of the socially situated nature of the research question.<sup>22</sup> We conducted semistructured interviews with 13 postgraduate trainees from Ireland, the Netherlands, the United Kingdom, and Denmark over a one-year period from 2015 to 2016.

We recruited English-speaking trainees from various medical training institutions within the sampled countries through personal communiqués with our personal contacts in the medical education community. During data collection, the issue of work hours was receiving a great deal of attention in the United Kingdom as junior doctors (similar to post-graduate medical trainees in the United States) were striking and negotiating contracts.<sup>23</sup> After beginning with convenience sampling, we shifted to purposeful sampling, which was informed by the iterative analysis.<sup>24</sup> Our intention in sampling from multiple countries was not to compare perceptions of work hours across settings. We aimed to sample for sufficient variation in the work hours policy, which was the studied

phenomenon; therefore, we limited our sampling to European countries that were at varying stages of implementation of the EWTD. We stopped collecting new data when we felt that we had achieved sufficient information power based on the high-quality dialogue with, and specificity of, the informants.<sup>25</sup>

One investigator (T.S.T.) conducted the semistructured, individual interviews in English over Skype (Luxembourg City, Luxembourg). Fluency in English was a criterion for being included in the study; however, several participants were non-native English speakers, which may have presented a challenge in fully expressing themselves. The interviewer addressed this possibility by attempting to put all participants at ease, asking clarifying questions, and summarizing their responses to confirm understanding. We created the interview guide (Supplemental Digital Appendix 1, <http://links.lww.com/ACADMED/A470>) based on insights gained through previous research in the Canadian context and our own lived experiences in the European training system. We further developed and revised the guide throughout the study based on preliminary analysis of the preceding interviews. Interviews were recorded and transcribed verbatim, and identifying names or places were subsequently removed from the transcripts. One of us (T.S.T.) recorded synchronous field notes with annotations not captured by the transcripts (e.g., “she seemed perplexed by my question” or “interview took place at home while he was watching his two children”).

Analysis proceeded iteratively, in keeping with constructivist grounded theory methodology, and as mentioned we revised the interview guide to reflect and further refine the emerging analytical insights.<sup>26</sup> After a period of open-coding, one of us (T.S.T.) used a process of constant comparative analysis to collapse early codes into major categories.<sup>26</sup> T.S.T. performed open-coding on incoming transcripts, which was informed by, but not restricted to, existing codes. She also returned to earlier transcripts when new codes or categories emerged. Then, T.S.T. and L.L. performed a preliminary review of this open-coding structure. Next, all researchers (T.S.T., L.L., P.W.T., T.D.) discussed the categories and illustrative examples, which both shaped the developing coding structure and directed

further theoretical sampling. Throughout this process, T.S.T. managed the data using a combination of NVivo software (QSR International, Victoria, Australia) and MindNodePro (IdeasOnCanvas, Vienna, Austria) software.

Rigorous constructivist grounded theory necessitates that the researchers involved are explicit about how their perspectives shape the research at all stages.<sup>26</sup> The primary investigator (T.S.T.) is a Canadian obstetrician/gynecologist who began this research during her residency training. She had conducted previous research with Canadian medical residents related to fatigue and work hours regulations. She engaged in reflexivity both by writing memos during data collection and by conducting the analysis with her coinvestigators. Coinvestigator P.W.T. completed his medical training after the implementation of the EWTD work hours regulations in the Netherlands. His orientation toward work hours and maintaining continuity with individual patients results both from his practical experience with the various effects of balancing work hours compliance and providing ongoing care for his patients, and from his experience as a researcher in the field of workplace learning in health care. Coinvestigator T.D. completed his medical training before the implementation of EWTD work hours regulations in the United Kingdom. His orientation toward work hours and maintaining continuity with patients relates to his program of research that empowers students and residents to learn in workplaces in the face of discontinuity. Coinvestigator L.L. is not a clinician; thus, her perspective remains theoretical.

The Health Sciences Research Ethics Board of Western University, the institution of the principal investigator (T.S.T.), approved this study (REB #102769).

## Results

Our data set included interview transcripts of interviews with 7 male and 6 female trainees working in Ireland ( $n = 1$ ), the Netherlands ( $n = 4$ ), the United Kingdom ( $n = 5$ ), and Denmark ( $n = 3$ ). The trainees worked in the following programs: anesthesia ( $n = 3$ ), general surgery ( $n = 1$ ), obstetrics–gynecology ( $n = 3$ ),

pediatrics (n = 2), general internal medicine (n = 1), nephrology (n = 2), and cardiology (n = 1). At the time of the interviews, each participant had completed the equivalent of internship training. Beyond that commonality, they were at varying stages of their training, ranging from prespecialty training to final year of specialty training. Although all participants were training under the legislation of the EWTD, this regulation was enacted differently across contexts. For example, participants from Denmark reported the most restrictive regulations: a 37-hour workweek that had been in place since the 1980s. At the other extreme, one trainee from Ireland reported that the EWTD had not yet been fully implemented at his/her institution.

Three main findings emerged from the analysis. First, trainees understood the regulations in many different ways, and they identified inconsistencies between the perceived intent of the EWTD legislation and how they experienced its actual implementation in practice. Second, trainees did not describe rigid adherence to the regulations; instead, they navigated the regulations on a day-to-day basis according to their perception of emerging priorities. Third, trainees described working while fatigued as a commonplace occurrence that they perceived as largely unproblematic. We have elaborated on each of these findings below, illustrating them with salient quotations and corresponding anonymous participant codes (###).

### Understanding the regulations

**Ensuring safety or continuity.** The regulations held various meanings for the trainees we interviewed, and they reported feeling a disconnect between the perceived intentions of the regulations and how they actually experienced them in practice. For instance, trainees commonly identified the regulations as means to prevent them from experiencing fatigue-related impairment: “My perspective on the work hour regulations is about safety, safety of patients and safety of trainees” (009). At the same time, trainees felt the regulations imposed unnecessary constraints that interfered with providing patient care on their own terms: “That’s difficult because you want to give the best care to your patient and then you feel penalized ... that, oh, you must go home” (009). As this last comment demonstrates, the safety value

of the regulations diminished for trainees if they felt the rules interfered with providing “the best” patient care. When reflecting on the implications of enforced regulations, another trainee reported providing less-than-ideal care while deflecting full responsibility for doing so: “If somebody just tells you that’s how it is, you have to do it, but then you lay off some of the responsibility for doing some not optimal work” (007). According to our interviewees, disruptions to continuity of care surfaced as a particularly undesirable consequence of work hours limitations: “You don’t have the same continuity with your patients or your teams.... Whereas, on the old system, there was much more continuity, so you knew your department, you knew your team” (010). Trainees reported valuing continuity because they believed it enabled “a better feel for the patient” (003). The perceived threat to continuity imposed by the regulations contradicted the intention of those same regulations to improve safety.

**Being compliant or inefficient.** Some trainees perceived that the regulations carried meaning about the time that clinical work *should* take; in this context, staying longer than the regulated work hours could imply inefficiency. Fear of being criticized for being a “poor time manager” (009) led some trainees to question whether they should work beyond their scheduled hours, even for the sake of continuity: “There’s lots of kind of hearsay ... about what happens if you put in your [actual] hours ... they’ll come back to you and say you’re not an efficient F1 doctor” (001). Conversely, those who were able to work within the regulations had a sense of accomplishment: “When I talk to my colleague residents, they often ask me ... how can it be that you are finished at 5:00? I just work effectively, in my opinion, and get your priorities straight” (011). Other trainees found that the regulations highlighted the fiscal burden of working outside the restrictions: “because of the economic climate, we are not allowed to have extra hours if we in any way can help it” (007). Our interviewees’ comments indicated that while they understood the work hours restrictions as expressly intending to promote a patient safety agenda, they perceived a tacit understanding that the rules also functioned as a barometer for efficient work practices.

**Preserving well-being or professional autonomy.** Another meaning of work hours regulations, as perceived by the trainees we interviewed, was protection against exploitation; however, trainees simultaneously perceived that the limited work hours could undermine their vocational autonomy. Generally, trainees appreciated that the regulations called attention to the issue of excessively long working hours:

Before the European Working Time Directive came in and the monitoring, there was no impetus to look at the hours you were working. There was no drive. So when monitoring came in and the hospitals got fined for being outside the European Working Time Directive, that was the first time ever people said, “you need to go home now.” (010)

One trainee emphasized the intended benefits for trainees’ well-being, when she acknowledged, “there’s a reason we should be going home ... in the longer term, it’s probably better for your health if you do go home and have a better work/life balance” (001), and yet the same trainee, like many others, found the rules unacceptably restrictive: “I’m quite obsessive. I like knowing what’s going on with my patients, so if my patients needed stuff doing I would stay. Sometimes I got quite frustrated when I kept getting told to go home” (001). Trainees received the message to go home from other colleagues, occasionally attending physicians and sometimes nurses. The trainees we interviewed noticed the trade-off between personal satisfaction and abiding by work hours regulations as an imposition coming from the institutional level. One commented:

We’re starting to see more and more junior doctors leaving the hospital work because they find they can’t have the life they would like to have in the departments.... They don’t find that they have any autonomy on work. It’s the employer who decides everything and the workload is too high....” (002)

Trainees found the regulations rigid and overbearing, which detracted from their intended purpose of preventing employees from being overworked.

### Navigating regulations

Despite the perceived rigidity of the regulations, trainees—some more often than others—chose to work beyond scheduled hours. Regardless of how

frequently they chose to work past their shift's official end, trainees provided a range of justifications for doing so. One justification was patient care: "If you had been involved in a particularly complicated case ... then that might keep you there because you are so involved that you need to talk to people afterwards" (006). Other justifications included fulfilling tacit expectations ("If you want to work here afterwards, you need to do this" [007]); compensating for an understaffed team ("it's usually so busy that you want to help your colleagues... And you would feel bad to leave them with all the work" [013]); or satisfying educational goals ("you do want to be there for the stuff that's going to improve your training" [003]).

Nonservice educational activities (e.g., preparing for a lecture or rounds) generally did not count toward working hours. Conversely, all service hours counted toward the working hours, even when "you just are sleeping your whole shift away, you don't learn anything" [002]. Overall, in many cases, trainees described a mismatch between their scheduled work hours and the actual time they spent at work providing patient care or gaining educational experience.

### Fatigue as an accepted reality

According to our participants, across all studied contexts, trainee fatigue was an accepted reality—in spite of the EWTD. Trainees provided many examples of the ways in which fatigue was evident in themselves and others: communicating poorly, being "totally unkind" (008), feeling reluctant to get out of bed and see patients, and struggling to remain coordinated during surgery. Trainees expressed a sense that fatigue was commonplace, yet not freely spoken about, and certainly not a justification for substandard work: "we're kind of all tired all the time, but people don't really say it. I mean, people say, 'I'm tired,' but they don't say, 'Oh, I can't do that because I'm tired'" (003). Despite its pervasiveness in the clinical environment, fatigue did not warrant further contemplation among many trainees. To illustrate, one commented, "There isn't so much navel-gazing or reflection either on the presence of tiredness or even how that might be modifying how you work" (008). They reported that such "navel-gazing" about fatigue was futile because there was nothing to be done about it. One resident

observed: "When I've decided to do the thing, I have to finish it up.... I can't just say, 'Well, I'm tired, I have been on call, so I can't go to that important meeting'" (002). Others questioned the relevance of fatigue as a safety threat within their own practice, sometimes because they did not want to imagine that fatigue might be an issue. For example, one trainee reflected:

In my experience, when I've worked particularly long hours, I can still do my job but ... things like driving home become more difficult.... I don't think, as doctors, we like to think we ever cause harm to our patients.... I really dislike the idea that my standard of care at 8:00 AM and 4:00 AM would be different. (010)

Thus, trainees across all sampled contexts understood fatigue as a familiar experience, though only variably problematic or relevant to their clinical duties.

### Discussion

We set out to understand the nature and impact of implementation of the EWTD regulations and its relevance to fatigue, as perceived by trainees who experience its effect in day-to-day practice. Our results reflect the "dazzlingly complex moral, social, intellectual, and cultural enterprise of academic medicine"<sup>27(p141)</sup> in which participants work and train—a context in which, according to our participants, work hours regulations have both intended and unintended effects.

Among the varied meanings of work hours regulations, as trainees understand them, we have identified three rhetorics: the rhetoric of patient safety, the rhetoric of well-being, and the rhetoric of efficiency. By identifying these *as rhetorics*, we are acknowledging that these meanings are not only descriptive but also constructive: that is, they shape peoples' attitudes and actions. Further, these rhetorics have implications for understanding the effects of regulations in medical training contexts both inside and outside of the EWTD.

The rhetoric of patient safety that emerged in our study is also well established in the literature.<sup>5,28,29</sup> Within this rhetoric, patient safety is used both to justify and to challenge the regulations. This rhetoric seems to establish a false dichotomy wherein patients can be cared for either by

a succession of unfamiliar yet well-rested trainees, or by a fatigued and potentially impaired trainee providing continuous care. Neither situation is ideal. To resolve this false dichotomy, we must critically examine the two main underlying assumptions. First, the notion that reducing work hours will alone necessarily result in rested trainees is questionable.<sup>15,27</sup> The second assumption worth examining is the belief that safe care is contingent upon individual continuity of care. Indeed, medical educators have maintained that fragmented care is problematic because of inadequate transfer of information from one provider to the next.<sup>30</sup> Trainees in our study echoed this assumption and generally maintained that individual continuity of care is synonymous with safer care; however, team-based concepts of continuity have shown promise in reducing the adverse events that may result from patient handoffs.<sup>31</sup> The success of structured team-based handover strategies requires a reframing of continuity in which team members share the responsibility.<sup>32,33</sup> We believe, therefore, that before policy makers implement work hours regulations in other contexts, exploring how continuity is defined in the workplace is worthwhile. A deliberate move toward team-based models of continuity, as Starmer and colleagues<sup>31</sup> have modeled, might shift the patient safety discourse from rhetoric to reality.

The second rhetoric our study participants addressed is the rhetoric of well-being; this rhetoric is also well described in the literature on resident work hours, which has focused primarily on the negative impact of extended work hours on trainees' well-being.<sup>1,34,35</sup> Many trainees in our study felt that the rules compromised their sense of vocation, in spite of well-intentioned regulations. Trainees perceived that they had lost aspects of their role, including autonomy and self-regulation, that made them professionals. Surgical trainees in other studies who identified long working hours as a rite of passage have cited similar reservations.<sup>36,37</sup> That is, the rhetoric of well-being is complicated by a perceived threat to the professional ethos. Others have demonstrated that individuals' autonomy over work hours is a significant predictor of "job satisfaction, lack of fatigue, and social functioning"<sup>38(p27)</sup>—regardless of the total

hours actually worked.<sup>39</sup> Given that well-being, like fatigue, is a complex social construct, policy makers in other contexts should consider dimensions of well-being that align with professional values when implementing work hours regulations.

Although the first two rhetorics and the tensions they engender are well defined by the duty hours literature, the rhetoric of efficiency is less clearly defined. Our findings suggest that some trainees feel pressure to complete their work within the allotted time in order to avoid being labeled inefficient. Disturbingly, trainees in a different study have reported that hospital employers have threatened to “label” them “with ‘poor time keeping’ on end-of-rotation assessment” to ensure that trainees report only compliant work hours.<sup>14(p5)</sup> In contrast, trainees working in the Canadian context believed they were demonstrating a commitment to the profession by working beyond their scheduled shift; efficiency was not an immediate concern.<sup>40</sup> An important consequence of the rhetoric of efficiency is the phenomenon of work compression: Trainees are expected to perform the same amount of work with fewer resources in fewer hours.<sup>14</sup> As Boodman<sup>41(p4)</sup> notes: “Residents live in the cracks of a broken health care system. They get things done.” Certainly, being efficient and getting things done are not inherently problematic—unless they come at the cost of quality, as some of our participants suggested. The rhetoric of efficiency has surfaced in other aspects of medical education as well. In their critical discourse analysis of resident feedback, Renting and colleagues<sup>42(p375)</sup> discovered that efficiency “emerged as an important attribute of physicians.” This rhetoric has implications beyond duty hours reform, particularly regarding professional development. An overemphasis on being an efficient worker could undermine other roles, such as being a compassionate physician or lifelong learner, which may require time, not efficiency.

The three rhetorics we identified (of patient safety, of trainee well-being, and of efficiency) reflect trainees’ belief that fatigue is still a problem in spite of regulations and that the regulations do not reflect reality. Other researchers have come to similar conclusions in European contexts and in the United States and Canada.<sup>20</sup> Douglas<sup>10</sup> reported

that 81% of trainees experienced fatigue despite maintaining an EWTD-compliant rota. A cohort of U.S. general surgery residents scored similarly on a standardized assessment of sleepiness before and after implementation of work hours regulations.<sup>43</sup> A literature review by Morrow and colleagues<sup>44</sup> prompted the question of whether fatigue can be managed by simply restricting work hours.

Many possible explanations may account for the persistence of fatigue. Landrigan<sup>2</sup> argues that issues of “circadian misalignment and chronic sleep deprivation” need to be taken into account. Another possibility is that interindividual differences in tolerance to sleep deprivation have an effect on fatigue.<sup>45</sup> Other factors, such as proportion of nighttime shift work and personal demands outside of the workplace, also influence fatigue and sleep opportunities.<sup>21,35,46</sup> These various explanations center on the notion of fatigue as a primarily physical or emotional phenomenon determined by hours of sleep and work. Physical fatigue is reproducible and quantifiable using surrogates such as attention, reaction time, or biochemical markers. However, fatigue can also be understood as a social construct, defined and propagated by the context in which it is situated.<sup>15</sup> The sense that fatigue is pervasive yet must not interfere with clinical duties, as suggested by our findings, is one example of how fatigue is socially constructed. Understanding fatigue as a social, not just physical or emotional, phenomenon allows us to consider more broadly why fatigue persists and how it may prompt these three rhetorics in the context of work hours regulations.

Like all qualitative research, this study is situated within a given context that inevitably shaped our findings. One salient aspect of our study was the contemporaneous junior doctors strike in the United Kingdom, which brought issues related to labor rights and work hours to the forefront.<sup>23</sup> Although few trainees overtly mentioned the strike, trainees who were affected by the junior doctors’ contract turmoil may have had a different perspective on work hours regulations than those who were unaffected. Our recruitment via personal communication also led us to key informants who were all

connected, in some way, to the medical education scholarly community. Had we recruited individuals outside of this community, different meanings of the regulations may have emerged. One of the implications of this constructivist research methodology is that we cannot know why certain kinds of patterns were visible and others were not; certainly what emerged relates both to what participants shared and what our analysis identified. For instance, we cannot answer the question of whether residents’ negative reactions to regulations are due to a perceived impact on their identity formation. Future research that seeks to answer this question would be worthwhile and timely.

## Conclusions

In our exploration of how trainees across four European countries understand existing work hours regulations, we found three rhetorics that are complicated by inherent tensions. Trainees in our study perceived a disconnect between what the EWTD explicitly intended and how they experienced its effects on their practice. Trainees accepted the tensions within each of the rhetorics, which suggests that some of these tensions may be functional despite seeming problematic. For example, trainees could invoke the rhetoric of patient safety to justify leaving on time or working past the restricted hours. This paradox is likely a reflection of the complexity of the academic environment,<sup>27</sup> a complexity that allows trainees not only to abide by the regulations to serve one purpose but also to challenge the regulations to uphold another purpose. Notably, we found that fatigue persisted despite the regulations. One possible explanation is that duty hours reform is designed to address the physical or cognitive aspects of fatigue, while overlooking the social constructs of fatigue. These insights are useful—regardless of whether a given jurisdiction is contemplating work hours reform, loosening restrictions, or maintaining existing regulations—as they highlight the limitations of straightforward interventions to solve complex problems. Future interventions that focus on mitigating the impact of fatigue in the workplace may be part of the solution because they will call attention to fatigue as a problem without denying its ubiquitous, socially constructed, context-dependent nature.

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## References

- 1 Ayas NT, Barger LK, Cade BE, et al. Extended work duration and the risk of self-reported percutaneous injuries in interns. *JAMA*. 2006;296:1055–1062.
- 2 Landrigan CP. Effect of lack of sleep on medical errors. In: Cappuccio FP, Mille MA, Lockley SW, eds. *Sleep, Health, and Society: From Aetiology to Public Health*. Oxford, UK: Oxford University Press; 2010:382–396.
- 3 Arnedt JT, Owens J, Crouch M, Stahl J, Carskadon MA. Neurobehavioral performance of residents after heavy night call vs after alcohol ingestion. *JAMA*. 2005;294:1025–1033.
- 4 Bilimoria KY, Chung JW, Hedges LV, et al. National cluster-randomized trial of duty-hour flexibility in surgical training. *N Engl J Med*. 2016;374:713–727.
- 5 Ahmed N, Devitt KS, Keshet I, et al. A systematic review of the effects of resident duty hour restrictions in surgery: Impact on resident wellness, training, and patient outcomes. *Ann Surg*. 2014;259:1041–1053.
- 6 Swanwick T. Informal learning in postgraduate medical education: From cognitivism to “culturism.” *Med Educ*. 2005;39:859–865.
- 7 Collier R. Sleepless in the surgical ward. *CMAJ*. 2009;180:1095–1096.
- 8 Temple J. Resident duty hours around the globe: Where are we now? *BMC Med Educ*. 2014;14(suppl 1):S8.
- 9 Murray A, Pounder R, Mather H, Black DC. Junior doctors' shifts and sleep deprivation. *BMJ*. 2005;330:1404.
- 10 Douglas NJ. Sleep, performance and the European Working Time Directive. *Clin Med (Lond)*. 2005;5:95–96.
- 11 Datta ST, Davies SJ. Training for the future NHS: Training junior doctors in the United Kingdom within the 48-hour European working time directive. *BMC Med Educ*. 2014;14(suppl 1):S12.
- 12 Cappuccio FP, Bakewell A, Taggart FM, et al; Warwick EWTB Working Group. Implementing a 48 h EWTB-compliant rota for junior doctors in the UK does not compromise patients' safety: Assessor-blind pilot comparison. *QJM*. 2009;102:271–282.
- 13 Morris-Stiff GJ, Sarasin S, Edwards P, Lewis WG, Lewis MH. The European Working Time Directive: One for all and all for one? *Surgery*. 2005;137:293–297.
- 14 Clarke RT, Pitcher A, Lambert TW, Goldacre MJ. UK doctors' views on the implementation of the European Working Time Directive as applied to medical practice: A qualitative analysis. *BMJ Open*. 2014;4:e004390.
- 15 Taylor TS, Watling CJ, Teunissen PW, Dornan T, Lingard L. Principles of fatigue in residency education: A qualitative study. *CMAJ Open*. 2016;4:E200–E204.
- 16 Lincoln YS, Guba EG. *The Constructivist Creed* [eBook]. Abingdon, UK: Routledge; 2016.
- 17 Parshuram CS, Amaral AC, Ferguson ND, et al; Canadian Critical Care Trials Group. Patient safety, resident well-being and continuity of care with different resident duty schedules in the intensive care unit: A randomized trial. *CMAJ*. 2015;187:321–329.
- 18 Maniatis T. Resident duty-hour reform: Moving beyond “change for change's sake.” *CMAJ*. 2015;187:309–310.
- 19 Tucker P, Brown M, Dahlgren A, et al. The impact of junior doctors' worktime arrangements on their fatigue and well-being. *Scand J Work Environ Health*. 2010;36:458–465.
- 20 Brown M, Tucker P, Rapport F, et al. The impact of shift patterns on junior doctors' perceptions of fatigue, training, work/life balance and the role of social support. *Qual Saf Health Care*. 2010;19:e36.
- 21 Tucker P, Bejerot E, Kecklund G, Aronsson G, Åkerstedt T. The impact of work time control on physicians' sleep and well-being. *Appl Ergon*. 2015;47:109–116.
- 22 Watling CJ, Lingard L. Grounded theory in medical education research: AMEE guide no. 70. *Med Teach*. 2012;34:850–861.
- 23 Brexit and junior doctors' contracts: The real threats to the NHS. *Lancet*. 2016;388:211.
- 24 Patton MQ. *Qualitative Evaluation and Research Methods*. London, UK: SAGE Publications; 1990.
- 25 Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: Guided by information power *Qual Health Res*. 2016;26:1753–1760.
- 26 Charmaz K. *Constructing Grounded Theory*. 2nd ed. London, UK: SAGE Publications; 2014.
- 27 Caldicott CV, Holsapple JW. Training for fitness: Reconsidering the 80-hour work week. *Perspect Biol Med*. 2008;51:134–143.
- 28 Businger AP, Laffer U, Kaderli R. Resident work hour restrictions do not improve patient safety in surgery: A critical appraisal based on 7 years of experience in Switzerland. *Patient Saf Surg*. 2012;6:17.
- 29 Baldwin K, Namdari S, Donegan D, Kamath AF, Mehta S. Early effects of resident work-hour restrictions on patient safety: A systematic review and plea for improved studies. *J Bone Joint Surg Am*. 2011;93:e5.
- 30 Petersen LA, Brennan TA, O'Neil AC, Cook EF, Lee TH. Does housestaff discontinuity of care increase the risk for preventable adverse events? *Ann Intern Med*. 1994;121:866–872.
- 31 Starmer AJ, Spector ND, Srivastava R, et al; I-PASS Study Group. Changes in medical errors after implementation of a handoff program. *N Engl J Med*. 2014;371:1803–1812.
- 32 Arora VM, Reed DA, Fletcher KE. Building continuity in handovers with shorter residency duty hours. *BMC Med Educ*. 2014;14(suppl 1):S16.
- 33 Arora VM, Farnan JM, Humphrey HJ. Professionalism in the era of duty hours: Time for a shift change? *JAMA*. 2012;308:2195–2196.
- 34 Barger LK, Cade BE, Ayas NT, et al; Harvard Work Hours, Health, and Safety Group. Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med*. 2005;352:125–134.
- 35 Baldwin DC Jr, Daugherty SR. Sleep deprivation and fatigue in residency training: Results of a national survey of first- and second-year residents. *Sleep*. 2004;27:217–223.
- 36 Coverdill JE, Bittner JG 4th, Park MA, Pipkin WL, Mellinger JD. Fatigue as impairment or educational necessity? Insights into surgical culture. *Acad Med*. 2011;86(10 suppl):S69–S72.
- 37 Veazey Brooks J, Bosk CL. Remaking surgical socialization: Work hour restrictions, rites of passage, and occupational identity. *Soc Sci Med*. 2012;75:1625–1632.
- 38 Costa G, Sartori S. Flexible work hours, ageing and well-being. *International Congress Series: Proceedings of 2nd International Symposium on Work Ability*. 2005;1280:23–28.
- 39 Cedfeldt AS, Bower EA, English C, Grady-Weliky TA, Girard DE, Choi D. Personal time off and residents' career satisfaction, attitudes and emotions. *Med Educ*. 2010;44:977–984.
- 40 Taylor TS, Nisker J, Lingard L. To stay or not to stay? A grounded theory study of residents' postcall behaviors and their rationalizations for those behaviors. *Acad Med*. 2013;88:1529–1533.
- 41 Boodman S. Waking up to the problem of fatigue among medical interns. *Los Angeles Times*. April 16, 2001. <http://articles.latimes.com/2001/apr/16/health/he-51548/2>. Accessed May 4, 2017.
- 42 Renting N, Dornan T, Gans RO, Borleffs JC, Cohen-Schotanus J, Jaarsma AD. What supervisors say in their feedback: Construction of CanMEDS roles in

- workplace settings. *Adv Health Sci Educ Theory Pract.* 2016;21:375–387.
- 43 Lindeman BM, Sacks BC, Hirose K, Lipsett PA. Multifaceted longitudinal study of surgical resident education, quality of life, and patient care before and after July 2011. *J Surg Educ.* 2013;70:769–776.
- 44 Morrow G, Burford B, Carter M, Illing J. The impact of the Working Time Regulations on medical education and training: Literature review. A report for the General Medical Council. [http://www.gmc-uk.org/The\\_Impact\\_of\\_the\\_Working\\_Time\\_Regulations\\_on\\_Medical\\_Education\\_and\\_Training\\_Literature\\_Review.pdf\\_51155615.pdf](http://www.gmc-uk.org/The_Impact_of_the_Working_Time_Regulations_on_Medical_Education_and_Training_Literature_Review.pdf_51155615.pdf). Published August 2012. Accessed May 4, 2017.
- 45 Czeisler CA. Ethical considerations for the scheduling of work in continuous operations: Physicians in training as a case study. In: Cappuccio FP, Miller MA, Lockley SW, eds. *Sleep, Health, and Society: From Aetiology to Public Health.* Oxford, UK: Oxford University Press; 2010:435–456.
- 46 Taylor TS, Nisker J, Teunissen PW, Dornan T, Lingard L. Recovery of sleep or recovery of self? A grounded theory study of residents' decision making regarding how to spend their nonclinical postcall time. *Acad Med.* 2016;91:395–400.