

Resident Work Hour Restrictions: Balancing Resident Education and Patient Safety

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After graduating, most medical students will continue on to complete a residency in some field of medicine. During residency, these young doctors expand their knowledge and gain clinical experience until eventually they are ready to start their own practices as competent, knowledgeable physicians. The skills and knowledge acquired during residency do not come without many hours of studying and practicing under the supervision of fully trained physicians; residents must work for many hours and perform many procedures and examinations before they are ready to practice medicine on their own. Indeed, the classic picture of a resident is one of an overworked, exhausted young doctor who never leaves the hospital. However, the American College of Graduate Medical Education (ACGME) is working to change this picture through new regulations that control how long and how often residents can work. These changes have been met with mixed reception by the medical community. Proponents believe that these regulations will improve patient safety and improve the quality of residents' lives by ensuring that residents have enough sleep, while opponents fear that these changes come at the price of residents' education.

Changes in residents' work hours were prompted by the untimely death of a young woman named Libby Zion.^{1,2} In 1984, Libby Zion was admitted to New York Presbyterian Hospital with what was suspected to be viral syndrome; while in the hospital, she was under the care of two junior residents.^{1,2} She had a fever, chills, myalgias, and arthralgias, and was noted to be experiencing strange jerking movements.² Zion had a history of depression and was taking a number of medications when she was admitted to hospital, including phenelzine, Percodan, erythromycin, and chlorpheniramine.^{2,3} She was given meperidine to control her shaking but became increasingly agitated.² The admitting intern ordered physical restraints and haloperidol, and did not see her again.^{1,2} She calmed down but at six o'clock the following morning, her temperature rose dramatically to 107° Fahrenheit.^{1,2} Shortly thereafter, she went into cardiac arrest and could not be resuscitated.^{1,2} A medical examiner

determined the primary cause of death to be bilateral bronchopneumonia, although there is some dispute regarding cause of death.^{1,2}

Zion's father, the journalist Sidney Zion, refused to accept that his daughter's death had been unavoidable. He discovered that the only doctors who actually saw his daughter were still in training and that the doctors who had seen her routinely worked for thirty-six hours without sleep.¹ He hired a lawyer and had a grand jury convened to consider murder charges against the physicians involved in his daughter's care.^{1,3} The grand jury did not indict the hospital or physicians involved in Zion's care, but instead held the system of resident training, which allowed residents to make major medical decisions after getting no sleep for twenty-four hours or more, to be at fault.² The jury issued a number of recommendations, advising all hospitals in New York state to have fully-trained physicians on hand in the emergency room, to have interns and junior residents supervised in person by fully-trained physician, and to limit consecutive working hours for interns and junior residents.² In response, New York State Health formed a panel led by Bertrand Bell, which recommended that residents should not be allowed to work more than eighty hours a week, that residents should not work more than twenty-four hours consecutively, and that all hospitals should have fully-trained physicians on hand at all times to supervise residents.³ These recommendations were adopted by New York State in 1989 and would come to form the basis of the ACGME's duty hour requirements that are applicable across the United States. The Institute of Medicine has more recently recommended further measures to limit resident work hours in order to prevent fatigue and improve patient safety.³

ACGME Duty Hour Requirements

Currently, the ACGME requires that:

- Residents work no more than eighty hours a week, averaged over four weeks.
- Residents have one day in seven off from all educational and clinical duties, averaged over four weeks.
- Residents have ten hours off after daily work hours and after in-house call.
- Residents not be on in-house call more than once every third night, averaged over four weeks.
- Residents not work for more than twenty-four hours consecutively, with a six-hour exception for continuity of care, transfer of patients, and didactic responsibilities.⁴

The ACGME assesses hospitals' compliance through anonymous resident surveys and site visits.⁴ The Institute of Medicine has since recommended that:

- Maximum shift length remain at thirty hours only if new cases are accepted within a sixteen hour window and if there is a protected five-hour sleep period between 10PM and 8AM. Otherwise, maximum shift length should be restricted to sixteen hours.
- Minimum time off between shifts be extended to twelve hours after a night shift and fourteen hours after a thirty-hour shift.
- Frequency of night shift be no more than four nights, followed by forty-eight hours off.⁴

Effect of Duty Hour Restrictions

The primary goal of the duty hour limitations is to improve patient safety and avoid tragedies like the Libby Zion case by reducing resident fatigue. The secondary objective is to improve the quality of residents' lives through reduced duty hours. There is fear that decreasing resident fatigue by reducing the number of hours spent in the hospital will come at the cost of residents' education. Whether or not the duty hour limitations have achieved their goals, and whether or not they have impacted residents' education in the process, is a focus of contention. It is important to look at the ACGME recommendations' effect on patient safety and resident education to determine whether or not the recommendations are achieving their goals and to make changes accordingly.

Patient Safety

Residency is notorious for its long work hours and enormous workload. Historically, residents were physicians who lived in hospitals and cared for patients under the supervision of hospital staff.⁵ Letters from an intern to his parents, written in the 1800s, report that he "only [slept] six hours in twenty-four."⁵ The tradition of long work hours in residency is an old one, and like most traditions, it is resistant to change. However, cases like that of Libby Zion and new generations of physicians and residents have pushed for and achieved major change.

Alertness and performance, which are crucial to the safe and effective practice of medicine, depend on the physicians getting a sufficient amount of quality sleep.⁶ Residents not only work extended shifts but regularly experience sleep deprivation and work during the biological night. Prolonged wakefulness severely impairs performance; performance after being awake for twenty-four hours is equivalent to that of a blood alcohol concentration of 0.10%.⁶ In other professions in which impaired performance can seriously harm others, such as truck drivers or pilots, federal regulations control how many consecutive hours these individuals can work; until the ACGME recommendations were put into place, residents, whose attention and performance is essential to the wellbeing of their patients, were allowed to work well past twenty-four hours.⁶

The primary motivator for ACGME duty hour restrictions is the fear that fatigued residents may, as a result of sleep deprivation, may make a mistake that will cost a patient his or her life. Various studies have shown that doctors are more error-prone when they are fatigued than when they have had adequate sleep.^{4,7} When interns work shifts lasting twenty-four hours or longer, they have a significantly higher rate of serious medical errors than when they worked restricted work hours.⁴ Another recent study showed that surgeons who have had less than six hours of sleep have an 83% increased risk of complications in elective daytime surgeries.⁷ In the Libby Zion case, meperidine was administered when the patient was known to be taking phenelzine; meperidine can interact with phenelzine to cause death.³ It is possible that the residents, in a fatigue-related lapse of attention, didn't check for potentially harmful drug interactions before prescribing meperidine and indeed the residents' fatigue was blamed for Zion's death. Fatigue-related medical errors don't usually have such severe consequences or garner such intense public scrutiny as this did, but near misses or small mistakes probably happen far more than is acceptable. Fatigue-related errors can be avoided by

creating a work environment that regulates work hours and encourages residents to get sufficient sleep.

In some respects, it appears that the ACGME duty hour restrictions have accomplished their primary goal of increasing patient safety. A 2008 survey performed by the ACGME found that fewer residents reported working eighty hours a week or more in 2004, after the work hour restrictions were implemented; similar results were found regarding shift duration.⁸ However, there is evidence to suggest that residents are falsifying their work hour reports.^{9,10} Residents may choose not to comply with the duty hour restrictions if they feel that patient care will be compromised or if they feel it will hurt their relationship with their patients or attending physicians. At a 2008 ACGME congress on duty hour restrictions, family medicine representatives reported situations in which residents were compelled by the duty hour limitations to leave their patients at crucial moments, such as when the patient was about to die or give birth.⁴ In these situations, residents may decide to report that they worked fewer hours than they actually did. Residents may also feel pressure from attending staff to work longer than the restrictions would allow; in these cases residents may think it is better to falsify their hours than to be perceived as lazy or uncommitted by senior staff. If residency programs or residents aren't complying with the duty hour limitations, the limitations won't be effective and will be perceived as having failed. The Institute of Medicine has recommended that the ACGME start performing more frequent, unannounced site visits and set up a system for individuals to report violations confidentially in order to ensure that programs and residents do comply with the duty hour limitations, so that the limitations can achieve their full effect.⁴

The effectiveness of the duty hour limitations on increasing patient safety is in doubt. A study performed by the ACGME of both medical and surgical residents at Massachusetts General Hospital and Brigham and Women's Hospital found that, following implementation of the ACGME duty hour recommendations, a smaller proportion of residents believed that work conditions contributed to medical errors and fewer residents reported committing medical errors after the work hours were put into place.⁸ A study on radiology residents found that attending radiologists are more likely to agree with radiology residents on a diagnosis with a restricted hour system than a traditional system, suggesting well-rested radiology residents perform better.¹¹ However, other hospitals and other specialties found no improvement in patient safety following implementation of the ACGME duty hour limitations.

A survey of general surgery residents performed at the State University of New York found that these residents don't believe that restricted work hours have reduced the rate of medical errors or improved the overall safety of patients.⁹ A study of pediatrics residents examined medication orders and adverse event rates and found no significant change in rate of medication errors or adverse events following implementations of the duty hour restrictions.¹⁰ Much more research is needed to determine whether or not patient safety has actually improved as a result of the duty hour restrictions.

It is interesting to note that specialties didn't agree on whether or not the duty hour limitations were effective for increasing patient safety. It is possible that the benefit of reduced fatigue is offset by the loss of time spent practicing and learning procedures in specialties that are particularly heavy in procedures, such as surgery. On the other hand, specialties that require more interpretation and similar cognitive processes, such as radiology, may benefit more if residents and physicians are well rested. There also seems to be a difference in how senior and junior residents view the duty hour restrictions.^{9,12} Senior residents tend to find the duty hour restrictions had no effect or were harmful, whereas junior residents tended to look at the restrictions in a more positive light.^{9,12} Senior residents are closer to being licensed and having to practice without supervision. These residents may be more concerned about getting sufficient time in the OR honing their skills than getting enough sleep. It may also be that, with time, resident programs and hospitals adjust to the duty hour restrictions and the limitations become the norm, rather than a major change.

Continuity of care is a major factor in the quality of patient care. The duty hour restrictions may negatively impact continuity of care since residents who have been compelled to leave the hospital will not be with their patients for the next steps in their care. For example, a surgical resident may examine a patient and book them for surgery but not be able to participate in the surgery itself. A major concern is that, because of increased handoffs necessary with decreased duty hours, patient safety will actually be compromised. Handoffs have been associated with increased medical errors, poor outcomes, and increased length of stay and costs.⁴ When one resident hands off his or her patients to another, decisions about that patient's care must be made by someone who doesn't know the case or the patient as well. In order for the duty hour limitations to reach their full effectiveness, issues of effective handoffs and continuity of care must be addressed.

Patient safety is certainly a priority for all physicians, hospitals, and clinics. If the duty hour requirements aren't increasing patient safety, they must be re-examined and changed so as to achieve their intended goals. This may mean stricter regulation of residency programs to ensure residents are complying with the limitations or changing the regulation themselves so as to be more effective. The lack of consensus on the effectiveness of the duty hour limitations in increasing patient safety is concerning. Programs that find no change in medication error rate or adverse event rate should re-examine their implementation of the duty hour restrictions and investigate other potential causes for medication errors and adverse events.

Resident Education

Inevitably, reducing the number of hours residents are allowed to spend working will reduce the number of hours they will spend in direct patient contact. Thus, residents will have less time to develop their skills. As mentioned previously, specialties in which technical expertise and procedural knowledge are especially important seem to be particularly affected by the ACGME work hour limitations. Their residents need to learn to perform a number of procedures and techniques that are best learned through repetition and developing muscle memory. It is still unclear whether or not residents are actually performing fewer procedures or have a decreased caseload, although it is certainly a risk.^{9,10,13-18} This issue warrants attention, as decreased experience may actually be detrimental to patient safety, despite decreased fatigue. To counteract the time lost in operations or performing procedures due to the shorter work hours, longer residencies may be necessary. This could make certain specialties, which already have long residencies, less appealing to medical students trying to decide on a specialty.⁹ If patient safety is not improving following duty hour limitations, it is possible that this is a result of residents spending less time with patients learning the skills and information they will need for their own practices.

During residency, young doctors learn to be professionals. There is concern that duty hour limitations may negatively impact residents' professional development. People get sick and patients need care twenty-four hours a day, seven days a week. Although it may be inconvenient or tiring to see a patient after hours or at odd times of day, physicians are expected to provide care when it is needed in exchange for the privileges given to physicians by society. Fully trained physicians do not have duty hour restrictions, and many fear that the restrictions will instill a shift-work mentality in residents that will persist throughout their

career.⁸ When residents become licensed and start to practice independently, they may be ill prepared for the hours and workload since they are no longer protected by the duty hour restrictions.

On the other hand, there is no doubt that the work hour limitations have improved the quality of residents' lives.^{6,14-17,19,20} Improving the quality of residents' lives in and of itself may improve patient care and may change how certain residencies are viewed. Following implementation of the duty hours, general surgery residents reported feeling more enthusiastic about their jobs; this is an exciting change for a specialty that is often avoided because of its lifestyle.⁶ More enthused and engaged residents may learn more than residents who don't enjoy what they are doing and are too fatigued to learn what is being taught. The positive effect of the duty hour restrictions on residents' wellbeing may be enough to consider the duty hour limitations a success, since happy residents will likely provide better care for their patients and engaged and eager to learn.

Work Hour Limits in Canada

The picture of resident work hour restrictions in Canada is quite different than that in the United States or the European Union. Resident work hours in Canada are regulated by each province, as opposed to nationwide regulations as in the United States.^{21,22} In Nova Scotia, resident work hours are limited to 24 consecutive hours on duty, with an additional two hours to complete handover.²³ The weekly limit is 90 hours, with no more than 360 hours in a 28-day rotation.²³ Residents may not be scheduled for call more often than one night per four days or 5 nights in a two-week period.²³

Change in resident work hour restrictions in Canada has been slower than in the United States. Indeed, the lack of change led medical residents in Quebec to file a grievance in 2007, stating that it was contrary to the Canadian Charter of Rights and Freedoms and the Quebec Charter of Human Rights and Freedoms to require residents to perform 24-hour call duty, and requested maximum number of hours to be reduced to 16 hours.^{21,22} Ruling in 2011 mandated that residents work no more than 16 consecutive hours, effective no later than July 1, 2012.²² That ruling is being appealed.²¹ In response, the Canadian Association of Internes and Residents issued a recommendation in April of 2012, advising restricting duty hours nationwide to 16 hours or less, managing duty hours to optimize education, providing formal handover training for residents and permitting flexibility in duty hours to accommodate both resident and service needs.²² The Royal College of Physicians and Surgeons have also indicated support

for the development of a nationwide policy on resident work hours in Canada.²¹

Closing Comments

Despite the ongoing debate regarding the value and efficacy of the ACGME duty hour restrictions, most can agree that increasing patient safety is the number one priority. In order to increase patient safety, it is crucial to find a balance between reducing resident fatigue and ensuring that residents complete their residencies as competent, knowledgeable physicians. At this point, it is not clear that the ACGME duty hour restrictions are fully achieving their desired outcomes. Many of the studies that have looked at the effect of the duty hour restrictions are poorly designed and have many limitations.¹⁴ There is no doubt that physicians perform best when they are well rested; not only are there ample studies to support this observation, but also the underlying physiology behind sleep and performance would suggest that performance is optimized with sufficient sleep. With this in mind, it is crucial to determine whether the duty hour limitations are being implemented effectively and complied with and if there are other factors at play that may be conducive to medical errors. The effects of the duty hour limitations on resident education and experience are still unclear and warrant further attention. In order to minimize resident fatigue and therefore insure that residents are able to perform at their best, it may be necessary to redesign residency programs to make sure education is delivered more effectively or, if need be, increase the length of residency. Restricting residents' work hours is necessary in order to improve patient safety, but this must be implemented in such a way that resident education is not compromised. With more residents, physicians, and educators paying attention to the role of sleep and performance, it is clear that the ACGME duty hour restrictions are the first of many changes to come.

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