

## The Phantom Menace of Sleep-Deprived Doctors



Jessica Dimmock for The New York Times

A pediatric resident naps in an on-call room during an overnight shift. The TV is often left on for white noise.

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Last month something extraordinary happened at teaching hospitals around the country: Young interns worked for 16 hours straight — and then they went home to sleep. After decades of debate and over the opposition of nearly every major medical organization and 79 percent of residency-program directors, new rules went into effect that abolished 30-hour overnight shifts for first-year residents. Sanity, it seemed to people who had long been fighting for a change, had finally won out.

Of course, the overworked, sleep-deprived doctor valiantly saving lives is an archetype that is deeply rooted in the culture of physician training, not to mention television hospital dramas. William Halsted, the first chief of surgery at Johns Hopkins in the 1890s and a founder of modern medical training, required his residents to be on call 362 days a year (only later was it revealed that Halsted fueled his manic work ethic with cocaine), and for the next 100 years the attitude of the medical establishment was more or less the same. Doctors, influenced by their own residency experiences, often see hospital hazing as the most effective way to learn the practice of medicine.

But over the last three decades, a counterpoint archetype has emerged: the sleep-deprived, judgment-impaired young doctor in training who commits a serious medical error. “Doctors think they’re a special class and not subject to normal limitations of physiology,” says Dr. Christopher Landrigan, an associate professor at Harvard Medical School and one of the most influential voices calling for work-hour reform. A large body of research on the hazards of fatigue ultimately led to the new rule on overnight shifts by the Accreditation Council for Graduate Medical Education, the independent nonprofit group that regulates medical-residency programs.

More than anything else, it was the death of 18-year-old Libby Zion 27 years ago that served as a catalyst for reform. Zion was jerking uncontrollably and had a fever of 103 degrees when she was admitted to New York Hospital on March 4, 1984. After she was admitted, Zion was given Tylenol and evaluated by a resident and an intern. They prescribed Demerol, a sedative. But her thrashing continued, and the intern on duty, who was just eight months out of medical school, injected another sedative, Haldol, and restrained her to the bed. Shortly after 6 a.m., the teenager’s fever shot up to 108 degrees and, despite efforts to cool her, she went into cardiac arrest. Seven hours after she was admitted, Libby Zion was declared dead.

Libby’s father was Sidney Zion, a columnist for The Daily News. When Zion learned that his daughter’s doctor had by then been on duty for almost 24 hours and that young doctors were routinely awake for more than 36 hours, he sued the hospital and doctors and publicized the conditions he was convinced had led to her death. Stories about overtired interns appeared in major newspapers and on “60 Minutes.”

Reforms followed, albeit slowly. In 1989, New York State cut the number of hours that doctors in training could work, setting a limit of 80 hours per week. And in 2003, the accreditation council imposed the 80-hour limit on all U.S. training programs, prohibited trainees from direct patient care after 24 hours of continuous duty and mandated at least one day off per week.

To Landrigan, this was tremendous, if incomplete, progress. He ran a yearlong study during which a team of interns at Brigham and Women’s Hospital worked alternate rotations, one on the traditional schedule — a 30-hour shift every third night — and the other on a staggered schedule, during which the longest shift was only 16 hours. The results, published in 2004 in The New England Journal of Medicine, shocked the medical world. Interns working the traditional 30-hour shifts made 36 percent more serious medical errors, including ordering drug overdoses, missing a diagnosis of Lyme disease, trying to drain fluid from the wrong lung and administering drugs known to provoke an allergy. Thomas Nasca, the director of the accreditation council, cites this data as the single strongest argument for limiting doctors’ work hours.

**But this is** where the neat story of the correlation between doctor fatigue and hospital error hits a wall. Landrigan’s research was compelling, but his study was small and controlled. In normal, day-to-day practice in hospitals across the country, medical errors didn’t fall when work hours were reduced. A massive national study of 14 million veterans and Medicare patients, published

in 2009, showed no major improvement in safety after the 2003 reforms. The researchers parsed the data to see whether even a subset of hospitals improved, but the disappointing results appeared in hospitals of all sizes and all levels of academic rigor. “The fact that the policy appeared to have no impact on safety is disappointing,” says David Bates, a professor at the Harvard School of Public Health and a national authority on medical errors.

Landrigan was dumbfounded. His experimental results aside, he was also moved by his own experience. When he was a resident in pediatrics at Children’s Hospital in Boston, Landrigan spent every third night in the intensive-care unit working a 36-hour shift. (I was also a resident there at the time.) One night in 1996, he had just gone to sleep in a call room when a nurse burst in to say that a 9-year-old girl, who had been admitted with asthma, was deteriorating rapidly. Rather than rushing to the suffocating girl, Landrigan, dazed from fatigue, arose from bed, sauntered into a bathroom, locked the door and began brushing his teeth in a confused state. Another doctor responded and put the girl on a ventilator, saving her life.

Landrigan was working on his own large-scale study when the 2009 Medicare study came out. His team read the hospital charts for thousands of patients from 2002 to 2007. The results, published last year, were equally sobering and showed that roughly a fifth of all hospitalized patients suffered harm from medical errors; cutting trainee work hours had no impact.

The question, then, is why? There are several possible explanations for the failure of the nationwide 80-hour rule to reduce medical harms. In 2008, the journal *Pediatrics* reported that two-thirds of residents regularly broke the rule, suggesting that poor enforcement, perhaps related to ingrained norms, had undercut the reform. Landrigan, one of the authors of that study, also thinks that the accreditation council did not go far enough; it had not, after all, banned being on call overnight and still allowed shifts up to 30 hours. Now that the council has abolished extended shifts, at least for first-year residents, Landrigan expects fewer errors.

And yet there are reasons to believe otherwise. About 98,000 people die every year from medical errors. Some of those mistakes are made by doctors whose judgment has been scrambled by lack of sleep. But fixating on work hours has meant overlooking other issues, like lack of supervision or the failure to use more reliable computerized records. Worse still, the reforms may have created new, unexpected sources of mistakes. Shorter shifts mean doctors have less continuity with their patients. If one doctor leaves, another must take over. Work-hour reductions lead to more handoffs of patients, and the number of these handoffs is one of the strongest risk factors for error. As a result, many hospitalized patients are at the mercy of a real-life game of telephone, where a message is passed from doctor to doctor — and frequently garbled in the process.

**Ted Sectish is a** no-nonsense, soft-spoken pediatrician who runs the residency program at Children’s Hospital in Boston and who has overseen residents for almost 20 years. To his mind, the fundamental problem is that most training programs fail to teach how to clearly convey vital information. “Patient handoffs are a nonstandardized process and a skill that’s not even taught,”

Sectish says with dismay. (A 2006 survey found that 60 percent of residents received no training in proper handoff procedures.)

Here is a stark example of what Sectish is complaining about, from a recent study of handoffs at Yale-New Haven Hospital, in which all trainee handoffs at the hospital were recorded for two weeks and analyzed to better understand communication problems. This is a verbatim record of a trainee giving a report to the doctor coming on shift:

“O.K., so this young woman, she came in with L.F.T.’s” — liver-function tests — “in the thousands. But she also had, she had something else. O.K. Yeah, I guess it was just this. So they, I think they just think it’s viral hepatitis. I don’t know why she’s still here. I guess they’re just waiting for her L.F.T.’s to normalize again, and then they’re going to send her home.”

How was the on-shift trainee to make sense of that? Later that evening, the woman’s blood glucose rose to dangerous levels because the handoff omitted a key fact: the medicine to keep it under control wasn’t given during the day. On average, one in four sessions studied resulted in errors.

I asked Sectish if I could observe a routine shift change at Children’s Hospital, so one evening in February, I accompanied him to a small conference room near the nursing station at a general pediatrics unit. Two trainees, one going off-shift and one coming on-shift, sat next to a dry-erase board on which were listed the 12 children under the team’s care. This was a light census; some nights, trainees can manage up to 40 patients. There were no supervising doctors or nurses in the room, which is typical.

Both doctors had a six-page printout of the patients’ names, medications, diagnoses and overnight to-do list. “Let’s go in alphabetical order,” the off-shift intern suggested. The first patient was a baby that was “failing to thrive,” or not gaining weight. “Mostly a social issue, nothing to do overnight,” he said. “What feeds?” the on-shift intern asked. “Oh, yeah — mostly purées,” came the answer. The specific “social issues” weren’t described.

Next on the list was a toddler with meningitis. “His potassium is low,” the off-shift intern said. But his report was interrupted by a knock on the door; a consulting specialist needed to discuss a child’s kidney stone. When the handoff resumed, the on-shift intern asked, “What did the kid with meningitis get for sedation in the CT scanner again?” They didn’t return to the potassium problem. Twenty minutes after they started, the handoff was over.

Sectish wasn’t surprised by what we saw, and he had many criticisms: patients were discussed in alphabetical order instead of severity of illness. The interns were repeatedly interrupted. Descriptions of the patients’ illnesses were incomplete. The chain of responsibility was sometimes left unclear. There was no decision, for example, about who would deal with the toddler’s low potassium level.

Sectish has been working to create better handoff procedures at Children's Hospital. In a three-month pilot project, young doctors were given team training, used computerized patient summaries and a structured verbal handoff (for example, always beginning with the sickest child, then a quick summary of the illness). Impressively, medical errors fell almost 40 percent and the amount of time doctors spent with patients increased. Residents throughout the hospital adopted the system this summer (the interns I saw had not yet been trained). Of course, the study was small and closely monitored, and so it's still unclear whether better handoffs will really mitigate the side effects of cutting trainees' work hours in the real world.

**In 2000, the** British psychologist James Reason wrote that medical systems are stacked like slices of Swiss cheese; there are holes in each system, but they don't usually overlap. An exhausted intern writes the wrong dose of a drug, but an alert pharmacist or nurse catches the mistake. Every now and then, however, all the holes align, leading to a patient's death or injury.

On a national scale, it seems safe to conclude that the efforts to cut doctors' work hours failed because the change was made in isolation. A rested doctor plugs a hole in only one slice of cheese. Holes in other layers — the frequency of patient handoffs, the continued use of antiquated pen-and-paper medical charts — remain.

In fact, Libby Zion's doctors may not have saved her even if they had been fully rested. Bertrand Bell, who ran the state commission formed to investigate her death, blames lack of supervision, not fatigue. "Supervision, not regulation of hours, is the key to improving the quality of patient care," said Bell, who is now 81 and is still an active clinician at Albert Einstein College of Medicine.

There were other holes in Zion's care too. Edward Boyer, the director of medical toxicology at the University of Massachusetts Medical School (where I am chief of pediatric cardiology) argued convincingly in *The New England Journal of Medicine* that Zion died from a medication-related reaction called "serotonin syndrome." This, he said, was a result of a disastrous interaction between the antidepressant phenelzine, which she had been on for weeks, and the Demerol she was given at the hospital. Though the syndrome was first described more than 50 years ago, surveys show that 85 percent of physicians have never heard of it and fewer still know the drugs that cause it. More than 7,000 people develop serotonin syndrome each year — it can occur as a side effect of common drugs like Prozac, Zoloft and over-the-counter cold medicines, and the risk jumps when offending drugs are given in combination, as they were to Zion.

I walked to our outpatient clinic to see what might happen if I prescribed both phenelzine and Demerol to a made-up patient using the clinic's electronic medical-record system. Immediately, a large box appeared with the message, "This combination of drugs is associated with a potentially fatal adverse reaction." Then I went over to the inpatient wards, where, as in roughly two-thirds of American hospitals, there is no computerized prescribing system. Nothing would prevent me from writing the orders for Demerol on the paper chart. Were Libby Zion admitted to a typical

hospital today, no matter how rested her doctor was, the same error that killed her could happen again.

Zion's death was never just a cautionary tale about the dangers of sleep deprivation in doctors. It was a nuanced saga about many layers of flawed health care practices, of which work hours were only the most apparent. What the persistence of errors tells us is not that we should repeal the work restrictions and return to a state of sleep deprivation, which is what most of the nation's residency directors would have us do. It instead suggests that we should redouble efforts to fix the remaining problems in medical training. In fact, Landrigan's seminal study succeeded precisely because he didn't merely shorten trainee work hours. A careful reading of his report reveals that he also created a clearer and more systematic handoff procedure and enhanced supervision by senior physicians in the intensive-care unit.

But all of these hospital reforms ignore what may be the biggest problem in physician training today: the yawning chasm between what most doctors learn during the 80 hours a week they spend training in hospitals and what they actually do after leaving their residencies. Defenders of the old-school way argue that the demands of medical practice justify the brutal hours. But after their residencies, most doctors practice in outpatient settings and work regular daytime hours as members of large groups. They treat chronic problems that need weeks or months of periodic outpatient follow-up, not high-intensity hospital-based care lasting only a few days.

"For people who came out of the old training system, it may be hard to imagine one that works better," says Donald Berwick, the director of the Centers for Medicare and Medicaid Services and former president of the Institute for Healthcare Improvement. "The point is, it's all about design and coming up with optimizing models."

Some researchers are trying small-scale innovative designs. Johns Hopkins Medical School, for example, hired professional "hospitalists" to work full time in the inpatient wards. This freed up trainees to concentrate on a smaller number of patients. Though they work fewer hours, trainees now spend more time with patients, make house calls after people are discharged and learn outpatient care for chronic problems. David Hellmann, who created the program, says the model cut heart failure readmissions by two-thirds, which offset the costs of the additional staff members.

Think about Libby Zion's medical care. Two months before her fateful admission, a doctor prescribed phenelzine. A month later, her dentist gave her narcotics after a tooth extraction. A few days later, yet another doctor prescribed an antibiotic and antihistamine for a possible ear infection. According to the grand jury report, she was also at some point prescribed two other antibiotics, the sedative Valium, a sleeping pill and yet another antidepressant — almost all of which can further worsen serotonin syndrome when used with phenelzine. For days at her apartment, she suffered from chills, body aches and joint pains that weren't investigated or

treated by any of her doctors, who never talked to one another. Before she was hospitalized, she was victimized by an absurdly fragmented outpatient system.

Imagine if Zion's doctors had been better trained to treat her chronic depression, made regular follow-up phone calls to their patient, kept better records, coordinated her drugs to prevent serotonin syndrome. Perhaps they could have avoided her sudden deterioration in the first place, and no hospital trainee, sleep deprived or wide awake, would ever have seen her.

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