

# On the Clock

In a Dec. 26, 2007, letter to *The Journal of the American Medical Association (JAMA)*, Bertand Bell, M.D., who chaired a 1987 New York State commission on residency training, described the startlingly offhand calculation used to decide how long residents could work without endangering patients or themselves. The Bell Commission had been created in the wake of the death of a young woman in a New York City hospital, under the care of two unsupervised and apparently overworked residents. The commission's recommendation of an 80-hour workweek not only became state law in 1989, but in 2003 also formed the basis of national rules mandated by the Accreditation Council for Graduate Medical Education (ACGME).

"The specific '80-hour week' was determined by a colleague on my porch," Bell wrote in his letter to *JAMA*, "and was based on the following informal reasoning: There are 168 hours in a week. It is reasonable for residents to work a 10-hour day for five days a week. It is humane for people to work every fourth night. If you subtract the 50-hour workweek from 168 hours, you end up with 118 hours.

**Adapted with permission from an article by Linda Keslar, in *PROTO*, the magazine of Massachusetts General Hospital ([protomag.com](http://protomag.com)), Spring 2011 issue.**

If you then divide 118 by four (every fourth night), it equals 30. If you then add 50 to 30, then eureka, an 80-hour week."

Informal reasoning, indeed. Yet now, in a further attempt to safeguard patients and residents, ACGME is instituting additional limits. This July, new standards for the nation's 114,115 physicians-in-training went into effect, restricting the number of consecutive hours that interns ("first-year residents") may work without sleep, from the customary 30 hours to 16 hours. Meanwhile, more experienced residents will be limited to 24-hour shifts, and they'll be urged to pursue "strategic napping."

How these tighter restrictions will affect the many teaching hospitals that depend on residents as a vital resource remains to be seen. "I don't think that anyone would argue against the notion that well-rested trainees can and will provide better care," says John Co, director of graduate medical education at Partners HealthCare, which has more than 1,200 residents and clinical fellows at the Massachusetts General Hospital (MGH) and Brigham and Women's Hospital in Boston. "But, the question is, how do you implement that in practical terms?"

Perhaps more crucial, medical educators worry that the reduced shifts will provide an insufficient educational experience. "I'm concerned whether residents will see enough patients," says Craig Brater, dean of the Indiana

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University School of Medicine, which has more than 1,000 residents. “Will residencies need to be longer?”

Others are worried that shorter hours might even increase medical errors if the change results in patients being handed off more frequently from one resident to another. And so far, there has been little conclusive evidence to validate Bell’s on-the-porch estimate or to gauge the impact of the 2003 reforms. “We’re making a very big, expensive change in residency programs, and the problem is we don’t have enough high-quality data from real residency programs to know how to do this and improve outcomes,” says Vineet Arora, associate professor at the Pritzker School of Medicine of the University of Chicago.

For soon-to-be residents, that adds up to an uncomfortable level of uncertainty. “If I’m in the hospital less, I’m afraid I’m going to learn less,” says Celine Goetz, new resident at New York-Presbyterian Hospital/Weill Cornell Medical Center. “Every institution seems to have a different philosophy about the changes, and no one really knows what the impact will be for medical education. My class is going to be the guinea pigs.”

Since the early 20th century, when U.S. medical school graduates began competing for a scarce number of positions that offered a year or two of living and working in hospitals as “house pupils,” there has been little question about what residency would hold: a rite of passage notorious for hard work and extreme hours. After the First World War, this system of medical apprenticeship evolved into a hospital-based educational program with conferences, clinical rounds, lectures and other types of formal and informal instruction, according to Kenneth Ludmerer, a physician and professor of medical history at Washington University in St. Louis. As medical specialties established themselves, they spawned residencies that could last as long as seven years. Medical schools looked upon this additional training as an essential complement to what they provided, while hospitals saw residents as inexpensive providers of up-to-date care for a growing patient population. “That has been the tension from the very beginning, the fact that hospitals have benefited from residents versus the needs of residents to have a genuine educational experience.” Before long, residents were regularly working 36-hour shifts and 120-hour weeks, in what most physicians considered apt, if grueling, preparation for the realities of professional practice. “I remember being an intern and not having a single day off during 50 weeks and being so tired I couldn’t examine a patient,” says Ludmerer. Although concerns about resident burnout arose as early as the 1950s, it was several decades before anything was done to address the issue.

It took a “confluence of forces”—including the patient safety movement, advances in data collection, and the rise of medical consumerism—to raise

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public awareness of residency issues. But it was the death of Libby Zion in 1984 that really made people think something had to be done. When Zion, 18, was admitted to New York Hospital with a 103-degree fever, there was no attending physician on duty. An intern and a second-year resident, working 36-hour shifts, were unable to come up with a diagnosis, and they prescribed an analgesic and a sedative. Zion's temperature ultimately spiked to 108 degrees, and she died within hours. Zion's father, a prominent New York journalist, launched a campaign for greater resident supervision and brought charges against the hospital and residents. Then came the Bell Commission and the Bell Regulations, the rules requiring that residents in New York state work no more than an average of 80 hours a week, that shifts be a maximum of 24 hours, and that residents be supervised by senior physicians present at the hospital. New York became the first (and still is the only) state to regulate residents' hours.

On the national front, pressure for reform began mounting as well. In 2001, Public Citizen, a consumer advocacy group, led a coalition that petitioned the U.S. Occupational Safety and Health Administration (OSHA) to regulate resident work hours, and congressional legislation mandating work-hour limits was introduced the same year. OSHA, aware that ACGME was working on new rules, turned down the petition in 2002. In 2003, ACGME announced regulations that restricted interns to 80-hour workweeks (averaged over four weeks) with one full day off each week (averaged over four weeks), and no single shift exceeding 30 hours (maximum shift of 24 hours with six additional hours for education and patient handoffs).

Hospitals struggled to adapt, redrawing work schedules and hiring additional staff to make up for the missing resident hours. However, although residents worked shorter shifts, their workloads typically didn't decline in terms of the number of patients they admitted or managed. Compliance with the rules was hardly universal. In 2006 and 2007, 16 percent of sponsoring institutions had racked up at least one duty-hour violation, and by academic year 2010–2011, 56 residency programs were on probation with ACGME for work-hour violations and similar issues. Despite attempts to comply with the 2003 regulations, evidence mounted that long residency shifts continued to bring the risk of serious medical error. In a 2006 study by the Harvard Work Hours Health and Safety Group, for example, one in five residents acknowledged making a fatigue-related error that harmed a patient, and one in 20 said such a mistake had led to a patient's death. A separate 2006 study by the same group found that residents who worked more than 20 hours at a stretch were 73 percent more likely to injure themselves with a needle or scalpel than those whose shifts lasted 12 hours.

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Upon request by a subcommittee of the U.S. House of Representatives Committee on Energy and Commerce investigating medical errors, the Institute of Medicine (IOM) determined in 2008 that 30-hour shifts “promote conditions for fatigue-related errors that pose risks to both patients and residents.” The report recommended that residents be restricted to working just 16 hours—or, if doing 30-hour shifts, that they be given five hours of “protected” time for sleep in the hospital after 16 hours of work, and that they not be allowed to admit new patients during the second portion of such shifts. Moreover, the report also said that residents should get a 24-hour period away from the hospital once every seven days and a 48-hour break once a month.

In September 2010, ACGME published a final version of new rules that included some modifications of the IOM recommendations. In particular, it chose to focus on interns, limiting these first-year residents to 16-hour shifts (with eight hours off between shifts). More experienced residents, by contrast, can stay four hours beyond their 24-hour shifts to facilitate the transfer of a patient to another physician’s care as well as for education. And, in “unusual circumstances,” residents may delay their exit to care for a single patient when there are clinical, academic or humanitarian reasons to do so. Other changes to the requirements act on IOM recommendations regarding on-site supervision for interns and providing residents with more time for rest, but the ACGME rejected such measures as granting residents a weekend off each month.

All of these changes come even though research evaluating the effects of the 2003 duty-hour limitations on patient safety and mortality hasn’t been conclusive. One study found that shorter shifts for residents at the most teaching-intensive Veterans Health Administration hospitals were associated with lower mortality rates in patients with acute myocardial infarction, gastrointestinal bleeding or stroke. However, a second study showed that the reduced hours neither worsened nor improved mortality for Medicare patients during the first two years of implementation of the 2003 rules.

Meanwhile, the science of determining how long residents should work seems incomplete. The IOM report equates the impairment of being awake more than 16 hours to a blood alcohol level of 0.05–0.10 percent. The IOM also considered such studies as one showing that among interns in intensive care, those working traditional 24-hour shifts made more than five times as many serious diagnostic mistakes as those on the job no more than 16 hours. But Dr. Arora says that there’s scant evidence suggesting that 16 hours is the optimal shift length. “The magic number is one in which residents are well rested and also have an optimal clinical experience,” she notes. “From the data we’ve looked at, based mostly on three small studies, 16 doesn’t seem to be that number. We really need to study this further.”

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What's already clear is that the latest changes are putting severe pressure, financial and otherwise, on hospitals. In its report, the IOM estimated that U.S. teaching hospitals may need to pay as much as \$1.7 billion more in labor costs to cover new hiring because of the rule shift, while in a separate report, ACGME's estimates range from \$400 million to \$1+ billion, depending on how hospitals reallocate staff. Although advocates say these costs pale in comparison to the financial and ethical costs of preventable medical errors, hospitals are getting no help from the federal government to pay for implementing the changes.

Among a handful of specialties, standards have already evolved to cap residents' hours at levels that fall within the new rules. But programs in such disciplines as internal medicine, pediatrics, surgery and psychiatry are implementing strategies to achieve compliance with the new rules while maintaining educational quality. Among the steps are discontinuing nonessential training; hiring nurse practitioners, physician's assistants and physicians to pick up clinical duties; shifting patient care to more senior residents and faculty (without increasing their work hours); and switching patients to nonteaching units (eliminating the need for residents to staff the units and faculty members to oversee them).

"Safety net" hospitals, which serve poor and uninsured patients, are particularly dependent on interns and residents as a low-cost labor source. And with public funding already severely compromised, the new ACGME rules pose special challenges for such organizations as Los Angeles County/University of Southern California Medical Center. The system employs 836 residents, most of them county employees. "The county of Los Angeles and the state of California are facing a severe budget crisis, so we're not expecting much new funding to fill in for lost service time by residents," says Lawrence Opas, associate dean at the Keck School of Medicine at USC.

To comply with the new rules, MGH's surgical residency has been hiring more physician's assistants and nurse practitioners, as well as revising elements of how residents are trained. Because of necessary hour cuts, general surgical residents can no longer rotate through neurosurgery, urology, orthopedics and anesthesia. Andrew Warshaw, former surgeon-in-chief at MGH, worries that restricting resident hours could mean that surgical residencies have to be extended beyond the current five to seven years. "There's an exploding universe of knowledge in medicine, and with more to learn in less time, a lot of residents are finding they can't get everything they need," he says. A 2008 poll of chief surgery residents (the first whose entire residencies had been run with the 2003 duty-hour restrictions in place) showed that nearly two thirds were entering fellowships to further their training—adding more cost to their education and slowing the physician pipeline.

Physicians already in practice worry that the U.S. system could be moving away from a tradition of taking individual responsibility for patients. “None of us can picture practicing as they do in other countries, where there’s a 48-hour-per-week limit and physicians basically say, ‘My shift is over,’ ” says Joanne Conroy, chief health officer for the Association of American Medical Colleges. She notes that Europe’s duty-hour limits have contributed to physician shortages and longer training periods and have spurred concerns about continuity and mastery of skills. Yet there’s little likelihood that hospitals will find the funding to create the additional 8,247 residency positions that the IOM report said would be needed to pick up the slack.

Although advocates for stricter rules and a federal role cite lax enforcement by ACGME, that body has disciplined many residency programs. In coming years, research may help establish just how long residents can safely work. A study under way at the University of Pennsylvania (UoP) will evaluate how much sleep residents obtain at work and when they’re off duty, both before and after implementation of the 2011 rules, according to David Dinges, chief of sleep and chronobiology at the UoP, who served on the committee for the IOM report. “We need to further our understanding of how sleep makes a difference.” He also notes that there’s no evidence that trainees take advantage of shorter work hours to sleep more. “Residents must prioritize sleep,” he says. “What residents do in their discretionary time has to be part of the solution.”

### **CSA Bulletin Cover for Volume 60, Number 3 “Pescadero Foxtails”**

The cover photograph of this *Bulletin* issue was taken in the town of Pescadero in 1992 using a 4X5 camera and FP-4 film. It was later scanned and then processed in Photoshop.

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