Print "PDF version"

What's New in the Patient Safety World

August 2020

New Twist on Resident Work Hours and Patient Safety

Over the years, we've done many columns on the question about the impact of resident work hours on patient safety. The debate has always been "Would you rather be cared for by a tired resident who knows you or a wide awake one who doesn't know much about you?". Of course, at this time we don't have an unassailable answer to that question. Studies to date have had mixed results, some showing fewer errors in residents with more restricted work hours and others showing no change or even more errors.

It is indisputable that physiological changes and circadian rhythm disturbances in healthcare providers, such as fatigue and inattention, make errors more likely. There are plenty of studies now demonstrating deterioration in cognitive and physical skills with sleep deprivation or extended work shifts. For example, one recent study (Persico 2018) evaluated the cognitive performance (processing speed, working memory capacity, perceptual reasoning, and cognitive flexibility) of emergency physicians after a night shift of 14 hours (H14) and after a work shift of 24 hours (H24) and to compare it with tests performed after a rest night at home (H0). No cognitive ability was significantly altered after H14 compared with H0. But three of 4 cognitive abilities performance (processing speed, working memory capacity, and perceptual reasoning) were impaired at H24 compared with H0. Cognitive abilities were not different between residents and staff physicians (except for perceptual reasoning) and were not affected by the amount of sleep during the night shift.

Studies like these showing cognitive and performance deterioration with long shifts, and some well publicized incidents such as the Libby Zion case, led to the restriction of work hours for physicians in training. The Bell Commission, which developed the original residency workhour restrictions in New York State in the 1980's, cited the more frequent occurrence of hospital incidents at night and on weekends as a sign of work-related fatigue. Back then, we pointed out to that commission that those are also times when there is more cross-coverage of patients and the covering physicians generally have less knowledge about the patients they cover. So the debate has ensued as to which is worse:

errors related to fatigue or errors related to handoffs. It is fairly clear we must avoid fatigue as much as possible by adherence to workhour restriction rules. And we also need to focus on improvement of handoffs and other communication issues to improve patient safety.

Following the Bell Commission report in New York State, some states placed restrictions on the total number of work hours per week and number of consecutive work hours residents could work. Later, the ACGME developed similar guidelines restricting resident work hours to no more than 80 hours per week and no more than 16 consecutive hours. Then, in 2017, ACGME did backpeddle somewhat and allowed more flexible hours (shift of 24-28 consecutive hours were allowed).

In prior columns, we expressed our hope that 2 trials, the FIRST (Flexibility in Duty Hour Requirements for Surgical Trainees) trial and the iCOMPARE (Individualized Comparative Effectiveness of Models Optimizing Patient Safety and Resident Education) trial would provide clear cut answers to the fundamental question as to whether more restricted resident work hours had an impact one way or the other on patient safety and patient outcomes. Of course, the other important outcome anticipated from these studies was the impact on resident well-being.

We discussed the **iCOMPARE trial** in our April 2019 What's New in the Patient Safety World column "iCOMPARE Study on Resident Work Hour Rules". iCOMPARE involved 63 internal-medicine residency programs that were randomized to a group with standard ACGME duty hours or to a group with more flexible duty-hour rules that did not specify limits on shift length or mandatory time off between shifts (but still complied with the 80 hour per week restriction). The primary outcome measure, change in 30-day mortality, was not significantly different between the two groups (Silber 2019). Differences in changes between the flexible programs and the standard programs in the unadjusted rate of readmission at 7 days, patient safety indicators, and Medicare payments were also not significantly different.

A companion paper from the iCOMPARE trial looked at the effects of flexible scheduling vs. strict scheduling on sleep, sleepiness, and alertness of medical trainees (Basner 2019). The researchers found no significant difference between the groups in total sleep duration (as measured by actigraphy) or sleepiness (as measured by the Karolinska Sleepiness Scale). But noninferiority of the flexible group for alertness (as measured by the brief computerized Psychomotor Vigilance Test) was not established. They concluded that there was no more chronic sleep loss or sleepiness across trial days among interns in flexible programs than among those in standard programs. But both those measures were averages over time. Those in flexible-hour programs averaged 2.23 hours less sleep during night calls and the average was increased by sleeping more hours on days off. Also, those in flexible programs reported less alertness and more sleepiness after extended night shifts than during day shifts.

A third paper from the iCOMPARE trial (Desai 2018) found no significant between-group differences in the mean percentages of time that interns spent in direct patient care

and education nor in trainees' perceptions of an appropriate balance between clinical demands and education. Scores on in-training examinations also did not differ significantly between groups. But a survey of interns revealed that those in flexible programs were more likely to report dissatisfaction with multiple aspects of training, including educational quality (odds ratio 1.67), overall well-being (OR 2.47), and how the program affects their personal lives with friends and family (OR, 6.11).

We discussed the **FIRST trial** in our March 2016 What's New in the Patient Safety World column "Does the Surgical Resident Hours Study Answer Anything?". In the FIRST trial (Bilimoria 2016), more flexible resident work hours were not associated with an increased rate of death or serious complications or residents' perception of educational value but residents had more negative feelings about the impact on their personal lives with the more flexible hours

The FIRST (Flexibility in Duty Hour Requirements for Surgical Trainees) trial had found no significant difference in resident satisfaction with overall well-being and education between flexible and standard duty-hour policies after 1 year. Followup analysis in 2017 showed a decrease in negative perception of flexible duty-hour policies a year later. A survey of residents participating in the FIRST trial (Yang 2017) found that as PGY level increased, residents had increasing concerns about patient care and resident education and training under standard duty hour policies, but they had decreasing concerns about well-being under flexible policies. When given the choice between training under standard or flexible duty hour policies, only 14% of residents expressed a preference for standard policies. Khorfan et al. (Khorfan 2020) recently reported 4 year follow up to the FIRST trial. They found that, over time, there was a trend toward fewer 80-hour work week violations in the flexible arm (19.8% vs. 17.0%) and increased satisfaction with flexible duty-hours. Well-being decreased over time but this was seen in both arms. Residents in flexible duty-hour programs reported significantly fewer lapses in continuity than standard policy residents until all programs transitioned to flexibility in 2018.

So, did we have answers to our fundamental questions? Both the FIRST and iCOMPARE trials showed flexible resident work-hour policies have similar patient outcomes and resident educational values compared to the strict ACGME policies. That's reassuring. It pretty much answers the question that we raised from the beginning: the issue of fatigue vs. increased handoffs/discontinuity appears to be a wash.

But, wait a minute! A new study (Landrigan 2020) compared two schedules for pediatric resident physicians during their intensive care unit (ICU) rotations: extended-duration work schedules that included shifts of 24 hours or more (control schedules) and schedules that eliminated extended shifts and cycled resident physicians through day and night shifts of 16 hours or less (intervention schedules). Resident physicians made more serious errors during the intervention schedules than during the control schedules (97.1 vs. 79.0 per 1000 patient-days; relative risk, 1.53). The number of serious errors unitwide were likewise higher during the intervention schedules (181.3 vs. 131.5 per 1000 patient-days; relative risk, 1.56). Those results are contrary to what the researchers would expect.

Aha, you say! Those who espouse the less knowledge/more handoffs theory will say this supports their position. But not so fast! There was considerable variation between results at participating hospitals. The patient demographics and complexity of illness could not explain the differences. Though the characteristics of the patient population were similar in the 2 arms of the study, the number of patients per resident was not. Those hospitals with the highest resident physician workloads had the most negative results with the intervention. In fact, residents in the intervention (limited hours) group had more ICU patients per resident than those in the control (24 or more hours) group (mean 8.8 vs. 6.7). Once the results were adjusted for the number of patients per resident physician as a potential confounder, intervention schedules were no longer associated with an increase in errors.

And, of course, we can't discuss resident work hours without mention of handoffs. But we'll simply refer you to our many columns listed below. The researchers in the Landrigan study did discuss the possibility that an increase in handoffs may have played a role in producing more errors. Handoffs did increase in number at all participating hospitals. However, only three sites had worse patient safety outcomes with the intervention schedule than with the extended-shift schedule, and one had substantially better safety outcomes with the intervention. The authors felt that suggests that the increase in handoffs overall was unlikely to account for the results.

The Landrigan study shows us 3 important things:

- bigger patient workloads likely lead to more errors
- we need to focus not just on work hours, but also on workload
- studies to address this critical question are very difficult to design

Finding the "sweet spot" between resident fatigue and well-being vs. patient safety and patient outcomes probably still requires further tweaking of both scheduling and workload. And, as John Birkmeyer pointed out in an editorial accompanying the FIRST trial results, we also need to factor in that much of the work formerly done primarily by residents is now done by others (Birkmeyer 2016). There has been increased involvement of intensivists, attending physicians and mid-level providers as part of interdisciplinary teams, and hospitalists often attend to many of the non-surgical aspects of patient care in surgical patients.

Some of our other columns on housestaff workhour restrictions:

December 2008 "IOM Report on Resident Work Hours"
February 26, 2008 "Nightmares: The Hospital at Night"
January 2010 "Joint Commission Sentinel Event Alert: Healthcare Worker Fatigue and Patient Safety
January 2011 "No Improvement in Patient Safety: Why Not?"
November 2011 "Restricted Housestaff Work Hours and Patient Handoffs"
January 3, 2012 "Unintended Consequences of Restricted Housestaff Hours"
June 2012 "Surgeon Fatigue"

November 2012 "The Mid-Day Nap"
December 10, 2013 "Better Handoffs, Better Results"
April 22, 2014 "Impact of Resident Workhour Restrictions"
January 2015 "More Data on Effect of Resident Workhour Restrictions"
August 2015 "Surgical Resident Duty Reform and Postoperative Outcomes"
September 2015 "Surgery Previous Night Does Not Impact Attending Surgeon Next Day"
March 2016 "Does the Surgical Resident Hours Study Answer Anything?"
April 2019 "iCOMPARE Study on Resident Work Hour Rules"

Read about many other handoff issues (in both healthcare and other industries) in some of our previous columns:

May 15, 2007 "Communication, Hearback and Other Lessons from Aviation"
May 22, 2007 "More on TeamSTEPPS™"
August 28, 2007 "Lessons Learned from Transportation Accidents"
December 11, 2007 "Communication…Communication…Communication"
February 26, 2008 "Nightmares….The Hospital at Night"
September 30, 2008 "Hot Topic: Handoffs"
November 18, 2008 "Ticket to Ride: Checklist, Form, or Decision Scorecard?"
December 2008 "Another Good Paper on Handoffs".
June 30, 2009 "iSoBAR: Australian Clinical Handoffs/Handovers"
April 25, 2009 "Interruptions, Distractions, Inattention…Oops!"
April 13, 2010 "Update on Handoffs"
July 12, 2011 "Psst! Pass it on…How a kid's game can mold good handoffs"
July 19, 2011 "Communication Across Professions"
November 2011 "Restricted Housestaff Work Hours and Patient Handoffs"
December 2011 "AORN Perioperative Handoff Toolkit"
February 14, 2012 "Handoffs – More Than Battle of the Mnemonics"
March 2012 "More on Perioperative Handoffs"
June 2012 "I-PASS Results and Resources Now Available"
August 2012 "New Joint Commission Tools for Improving Handoffs"
August 2012 "Review of Postoperative Handoffs"
January 29, 2013 "A Flurry of Activity on Handoffs"
December 10, 2013 "Better Handoffs, Better Results"
February 11, 2014 "Another Perioperative Handoff Tool: SWITCH"
March 2014 "The "Reverse" Perioperative Handoff: ICU to OR"
September 9, 2014 "The Handback"
December 2014 "I-PASS Passes the Test"
January 6, 2015 "Yet Another Handoff: The Intraoperative Handoff"
March 2017 "Adding Structure to Multidisciplinary Rounds"
August 22, 2017 "OR to ICU Handoff Success"
October 2017 "Joint Commission Sentinel Event Alert on Handoffs"
October 30, 2018 "Interhospital Transfers"
April 9, 2019 "Handoffs for Every Occasion"
November 2019 "I-PASS Delivers Again"

References:

Persico N, Maltese F, Ferrigno C, et al. Influence of Shift Duration on Cognitive Performance of Emergency Physicians: A Prospective Cross-Sectional Study. Ann Emerg Med 2018; 72(2): 171-180
https://www.annemergmed.com/article/S0196-0644(17)31769-9/fulltext?code=ymem-site

Silber JH, Bellini LM, Shea JA, et al. Patient Safety Outcomes under Flexible and Standard Resident Duty-Hour Rules. N Engl J Med 2019; 380: 905-914
https://www.nejm.org/doi/full/10.1056/NEJMoa1810642

Basner M, Asch DA, Shea JA, et al. Sleep and Alertness in a Duty-Hour Flexibility Trial in Internal Medicine. N Engl J Med 2019; 380: 915-923
https://www.nejm.org/doi/full/10.1056/NEJMoa1810641

Desai SV, Asch DA, Bellini LM, et al. Education Outcomes in a Duty-Hour Flexibility Trial in Internal Medicine. N Engl J Med 2018; 378: 1494-1508
https://www.nejm.org/doi/full/10.1056/NEJMoa1800965

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 published online first February 2, 2016
https://www.nejm.org/doi/full/10.1056/NEJMoa1515724?query=TOC

Yang AD, Chung JW, Dahlke AR, et al. Differences in Resident Perceptions by Postgraduate Year of Duty Hour Policies: An Analysis from the Flexibility in Duty hour Requirement for Surgical Trainees (FIRST) Trial. Journal of the American College of Surgeons 2017; 224(2): 103-112 Published online November 4, 2016
https://www.journalacs.org/article/S1072-7515(16)31591-5/abstract

Khorfan R, Yuce TK, Love R, et al. Cumulative Effect of Flexible Duty-hour Policies on Resident Outcomes, Annals of Surgery 2020; 271(5): 791-798
https://journals.lww.com/annalsofsurgery/Fulltext/2020/05000/Cumulative_Effect_of_Flexible_Duty_hour_Policies.1.aspx

Landrigan CP, Rahman SA, Sullivan JP, et al. Effect on Patient Safety of a Resident Physician Schedule without 24-Hour Shifts. N Engl J Med 2020; 382: 2514-2523
https://www.nejm.org/doi/full/10.1056/NEJMoa1900669?query=TOC

Birkmeyer JD. Surgical Resident Duty-Hour Rules - Weighing the New Evidence (editorial). N Engl J Med 2016; 374:783-784 published online first February 2, 2016
https://www.nejm.org/doi/full/10.1056/NEJMe1516572?query=TOC

http://www.patientsafetysolutions.com/

Home

Tip of the Week Archive

What's New in the Patient Safety World Archive