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Inpatient Housestaff Discontinuity of Care and Patient Adverse Events

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For more than a decade, the medical community has been concerned about continuity of care. Concern began when the Accreditation Council for Graduate Medical Education implemented national duty hour limitations in 2003.[1] These rules became more restrictive in 2010.[2] The current rules include an 80-hour-per-week limit, no more than 16 hours consecutively (for interns) or 28 hours (for senior residents), and at least 8 hours off between shifts.[3] With the blessing of the Accreditation Council for Graduate Medical Education, 2 multicenter trials are beginning to study the impact of a return to less restrictive rules.[4-6]

The root of the concern about duty hour limits is whether the physician fatigue that existed prior to the duty hour rules is more dangerous than the resulting discontinuity caused by shorter shifts and more hand-offs.[7,8] However, an ideal shift length is not necessarily known or knowable. A 2010 systematic review examined shift length and patient outcomes, and no ideal shift length could be determined,[9] although shorter shifts were associated with fewer errors in some studies.[10-12] A more recent study showed no difference in intensive care unit patient outcomes with 12-hour, 16-hour, or 24-hour housestaff shifts.[13]

The relationship between fatigue, shift length, hand-offs, and discontinuity is complex.[14] It is clear that human performance suffers in the setting of too much fatigue.[15,16] However, fatigue is not only a result of shift length; sleep debt, time of day, and other factors also play a role. Some of these factors are within the control of residency programs (scheduling to avoid sleep debt) and some are not (the amount of sleep individuals get when not on duty). Minimizing fatigue while minimizing discontinuity is a challenge. To understand how important discontinuity is to patient safety, we conducted the following study to examine objectively measured aspects of discontinuity and their impact on patient adverse events (AEs). We hypothesized that less continuity would increase the risk of AEs.

Funding: This work was funded by VA HSRD IIR #07-201-2.
Conflict of Interest: None.
Authorship: All authors had access to the data, and all participated in the writing of the manuscript.

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http://dx.doi.org/10.1016/j.amjmed.2015.11.008

METHODS

This prospective cohort study of physician schedules with retrospective chart review of patient outcomes was conducted at 3 sites affiliated with the internal medicine residency program: an academic Veterans Affairs Medical Center (VAMC); a community teaching hospital; and a tertiary care private teaching hospital. The community hospital also has its own transitional-year intern program (see Appendix A, available online, for program details).

PERSPECTIVES VIEWPOINTS

- Discontinuity is an important concept for inpatient care.
- Measuring discontinuity is difficult in the inpatient setting.
- Inpatient discontinuity is not related to adverse events in hospitalized medical patients cared for by internal medicine residents.

We recruited housestaff assigned to general medicine services between March 16, 2009 and March 15, 2010. We did not include medical students. Physicians gave written informed consent. For a team to participate in the study, all physicians on the team had to consent.

A random sample of patients assigned to each participating team was selected each week, except for the 3 weeks surrounding the Christmas and New Year holidays. We excluded those times because we did not have staff available to collect data. We excluded patients that were 1) not on a participating team; 2) admitted directly to an intensive care unit; 3) cared for by a fourth-year medical student as an "acting intern;" 4) hospitalized for <48 hours (because many AEs require 48 hours to be labeled hospital-acquired); and 5) assigned to observation status at Froedtert Memorial Lutheran Hospital because those patients were admitted only to the hospitalist service. We obtained a waiver of informed consent for patients.

Data Collection

Research assistants at each site met with housestaff each weekday to record time in and out of the hospital for the previous 24-hour period. On Mondays, they collected the weekend data.

A study team member abstracted data from each chart (either CK or SF). These data included demographics, comorbidities using the Charlson Index,[17] date and time of admission and discharge or transfer (to another facility or another service), and AE data. Team physicians or trained research assistants collected data about the clinicians assigned to the patient through chart review or by review of sign-out documents. We determined the primary intern assigned to patients through the sign-out documents, and we identified admitting and discharging physicians through the medical record review (Appendix A has additional details).

Adverse Events. AEs were determined by retrospective chart review. The chart review focused on the notes written by the physician team and nurses, as well as the laboratory data. However, all aspects of the chart were available for review as needed. We used a standardized guide derived from similar studies (Appendix B, available online).[18-20] We classified AEs into 21 categories (see **Table 1** for list of AEs and their frequencies). We used standard definitions for AEs when they were available.[21-26] For the purposes of this analysis, we dichotomized patients as having experienced any AE or none. Each AE was abstracted first by the RN abstractor, who wrote a paragraph description of it. These AEs then were confirmed by an MD, who read the description and returned to the medical record if there was any question about whether it was an AE or how it was categorized. All disagreements were resolved by discussion between the RN abstractor and the MDs. Because the nurses reviewed every chart and the physicians reviewed only the events detected by the nurses, the nurses erred on the side of recording events, knowing that some events

Table 1 Adverse Events and Their Frequency

Adverse Event	n (N = 915)*
Adverse drug event	278
Serious electrolyte abnormality	126
Mental status change	75
Hypertensive urgency or emergency	44
Arrhythmia	39
Hypotension	37
Respiratory distress or failure	25
Acute renal failure	21
Rapid response or code	20
Unexpected transfer to the ICU	20
Hospital-acquired UTI	20
Bleed	17
Fall	27
Pressure ulcer	14
Hospital-acquired pneumonia	13
Death	6
Clostridium difficile infection	7
Hospital-acquired bacteremia	5
Iatrogenic pneumothorax or hemothorax	4
Uncontrolled pain	2
Hospital-acquired DVT or PE	2
Hospital-acquired sepsis	2
Other	111

DVT = deep venous thrombosis; ICU = intensive care unit; PE = pulmonary embolism; UTI = urinary tract infection.

*Patients could experience more than one adverse event, so these do not add up to the number of patients that had adverse events in the sample.