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EFFECT OF THE ACGME 16-HOUR RULE ON EFFICIENCY AND QUALITY OF CARE: DUTY HOURS 2.0

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Keywords

Resident duty hours; medical education; patient safety

In July 2011, the Accreditation Council for Graduate Medical Education (ACGME) reduced the consecutive number of hours that post-graduate year-1 residents can work in a single shift, from 30 to 16.¹ This rule was intended to improve patient safety by reducing residents' fatigue. Many worry that the new duty hour policy increases patient care handovers, which may cause patient harm. The net effect of the 16-hour duty limits on patient outcomes is uncertain.

Methods

In April 2011, the Vanderbilt Internal Medicine Residency Program redesigned its rotations to reduce the maximum continuous on-duty period to 16 hours. We retrospectively examined the efficiency and quality of care for non-intensive care unit (ICU) medical inpatients under the 30-hour (July-December 2010) and 16-hour (July-December 2011) duty limits at Vanderbilt University Hospital. Patient cohorts were constructed from 8 Internal Medicine resident services, with non-resident hospitalist concurrent control groups. Measures included continuity (weekly handovers); efficiency (length of stay [LOS], time of discharge); and quality and safety (Agency for Healthcare Research and Quality patient safety indicators [PSI],² University HealthSystem Consortium complications,³ observed to expected [O:E] in-hospital mortality, all-cause 30-day readmissions to the same facility, in-hospital rapid response and code events, and ICU transfers).

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Results

Rotation changes increased the number of weekly handovers from 56 to 126. The 30-hour cohort (N=2025 patients) and 16-hour cohort (N=1966 patients) did not differ significantly in hospital LOS, although mean time of discharge was 25 minutes later in the 16-hour cohort (Table). No statistically significant differences were seen in PSIs, O:E mortality, 30-day readmissions, rapid response team events, codes, or ICU transfers. UHC complications declined in the 16-hour resident cohort, with a similar trend observed among non-resident hospitalist services.

Comment

Restructuring resident rotations to accommodate the ACGME 16-hour duty limits substantially increased patient care handovers, but did not significantly affect efficiency and quality of care among medical inpatients.

Increased handovers were an unintended consequence of the 2003 duty-hour changes.⁴ We anticipated increases in handovers with further work-hours restriction, because patients would be admitted by night residents and transferred to new providers in the morning. Indeed, we found a striking two-fold increase in handovers. Although we expected a corresponding rise in inefficiencies, we demonstrated no significant change in hospital LOS. We did observe a delay in discharge time of almost 30 minutes, which may be relevant in an era of pressures to improve patient throughput.

Poorly executed patient handovers are associated with medical errors,⁵ and we therefore evaluated the effect of the 16-hour restrictions on patient safety outcomes. We found no significant change in rates of AHRQ PSIs, consistent with previous findings.⁶ Additional patient safety outcomes, including rapid response and code events, ICU transfers, and inpatient mortality, did not differ significantly between the study periods, though the relatively small sample size may have resulted in insufficient power to detect uncommon events. There was a statistically significant decrease in UHC complications after implementation of the 16-hour rule. However, a similar trend occurred among patients treated on the non-resident hospitalist services, which suggests a secular effect. Importantly, the increase in patient handovers with the 2011 policy change coincided with the introduction of a new structured electronic handover application and formal handover education for residents. Additionally, transfers of care to new providers may bring fresh insights, and therefore, may offer opportunities to appreciate and correct prior lapses in care.⁷ Both factors may have attenuated safety hazards introduced by discontinuity.

An outcome of increasing focus is hospital readmission. Residents are intimately involved in the discharge process, and discontinuity may lead to fragmented and poorly planned transitions of care. Consistent with the literature on prior duty hour changes,⁸ we found no significant changes in 30-day all-cause readmissions to our institution after implementation of 16-hour duty limits.

Overall, the 16-hour duty hour changes appeared to have minimal effects on measures of efficiency and quality of care. Several reasons might explain the net neutral outcomes. Although a main goal of restricting shift length was to reduce resident fatigue, thereby improving resident performance and consequently patient care, residents' total work and sleep may not change.⁸ Others have hypothesized that the pressure to complete the same amount of work in less time might impair residents' concentration, leading to errors that might offset the potential benefits of reduced fatigue. Discontinuity and communication errors might also yield negative outcomes that mask any positive effects of reduced duty

hours.⁹ Finally, resident duty hours are one variable in a complex hospital system that contribute to patient outcomes.

The 16-hour duty limits are the latest in a progression of changes aimed at reducing resident stress and fatigue, and potentially improving the quality of patient care. Our study highlights a potential balance between harmful and beneficial effects, that in sum result in minimal overall impact when considering a wide-range of efficiency and quality outcomes.

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Table 1

Table Patient Care Outcomes on Resident Services with 30- and 16-Hour Duty Limits

Outcome	30-Hour (n=2025)	16-Hour (n=1966)	Difference between means (95% CI)
EFFICIENCY			
Length of stay, median (IQR, 25%, 75%)	3.04 (1.95, 5.64)	3.11 (1.91, 5.67)	-0.075 (-0.417, 0.267)
Observed: Expected length of stay	0.82	0.82	0.007 (-0.003, 0.017)
Time of discharge, median (IQR, 25%, 75%)	14:47 (12:58, 16:38)	15:15 (13:28, 17:08)	0:25 (0:14, 0:35)
All cause 30-day readmission, ⁺ n (%)	18.57%	17.80%	-0.77% (-3.20%, 1.60%)
All cause 30-day readmission ⁺ for pneumonia patients, n (%)	7.69%	0.00%	-7.69% (-18.70%, 3.30%)
AHRQ Patient Safety Indicators/1000 patients	3.46	1.02	-2.44 (-5.86, 0.98)
UHC complications/1000 patients	26.67	15.77	-10.90 (-20.30, -1.48)
UHC Observed: Expected mortality	0.41	0.55	0.14 (-0.01, 0.38)
Rapid response team events/1000 patients	16.30	18.31	2.02 (-6.59, 10.61)
Code events/1000 patients	0.99	1.02	0.03 (-1.97, 2.02)
ICU transfers/1000 patients	5.43	7.63	2.20 (-3.30, 7.70)

⁺Planned and unplanned

IQR=Interquartile Range; UHC=University HealthSystem Consortium; AHRQ=Agency for Healthcare Research and Quality