The Impact of the 2011 Accreditation Council for Graduate Medical Education Duty Hour Reform on Quality and Safety in Trauma Care

Jayson S Marwaha, BA, Brian C Drolet, MD, Suma S Maddox, MD, Charles A Adams Jr, MD, FACS

BACKGROUND: In 2011, the ACGME limited duty hours for residents. Although studies evaluating the 2011 policy have not shown improvements in general measures of morbidity or mortality, these outcomes might not reflect changes in specialty-specific practice patterns and secondary quality measures.

STUDY DESIGN: All trauma admissions from July 2009 through June 2013 at an academic Level I trauma center were evaluated for 5 primary outcomes (eg, mortality and length of stay), and 10 secondary quality measures and practice patterns (eg, operating room [OR] visits). All variables were compared before and after the reform (July 1, 2011). Piecewise regression was used to study temporal trends in quality.

RESULTS: There were 11,740 admissions studied. The reform was not strongly associated with changes in any primary outcomes except length of stay (7.98 to 7.36 days; $p = 0.01$). However, many secondary quality metrics changed. The total number of OR and bedside procedures per admission (6.72 to 7.34; $p < 0.001$) and OR visits per admission (0.76 to 0.91; $p < 0.001$) were higher in the post-reform group, representing an additional 9,559 procedures and 1,584 OR visits. Use of minor bedside procedures, such as laboratory and imaging studies, increased most significantly.

CONCLUSIONS: Although most major outcomes were unaffected, quality of care might have changed after the reform. Indeed, a consistent change in resource use patterns was manifested by substantial post-reform increases in measures such as bedside procedures and OR visits. No secondary quality measures exhibited improvements strongly associated with the reform. Several factors, including attending oversight, might have insulated major outcomes from change. Our findings show that some less-commonly studied quality metrics related to costs of care changed after the 2011 reform at our institution. (J Am Coll Surg 2016;222:984–991.

In 2011, the ACGME implemented revised standards for all residency programs in the United States that further restricted duty hours for residents. In addition to the 80-hour workweek limit set forth in the 2003 Common Program Requirements, these revised standards restrict PGY1 residents to shifts no longer than 16 hours, with at least 8 off-duty hours between shifts. More-senior residents with 24-hour shifts are allowed a maximum of 4 hours for transfer of care activities, followed by at least 14 off-duty hours between shifts.[1,2]

Although a primary goal of the 2011 Common Program Requirements was to reduce fatigue-related medical errors,[3] no recent studies have measured the policy's impact on these specific errors. Despite this goal, several national surveys have revealed that residency program directors and residents believe the quality and safety of care at their institution have either worsened or remained unchanged since the implementation of these new standards.[4-8]

In contrast to these perceptions, many retrospective studies after the 2011 policy reform have not shown

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From the Department of Surgery, Warren Alpert Medical School, Brown University (Marwaha, Drolet, Maddox, Adams) and Department of Surgery, Rhode Island Hospital (Drolet, Maddox, Adams), Providence, RI. Correspondence address: Jayson S Marwaha, BA, Department of Surgery, Warren Alpert Medical School, Brown University, 222 Richmond St, Box G-9079, Providence, RI 02903. email: jayson_marwaha@brown.edu

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Abbreviations and Acronyms
ISS = Injury Severity Score
LOS = length of stay
OR = operating room
TPN = total parenteral nutrition

any change in mortality, length of stay, readmission rates, and other general outcomes metrics.[9-12] Similarly, most studies after the original (2003) Common Program Requirements reported no improvements in mortality and major indicators of morbidity.[3,13-16]

Although mortality and serious morbidity have ostensibly not been affected by duty hour standards, more specific effects of the 2011 regulations on quality and safety have not been studied extensively. The ACGME and others have noted that the study of nonspecific patient outcomes, such as all-cause mortality, has made it difficult to identify the source of any changes in quality, as these measures are also influenced by several other factors unrelated to duty hours.[3,9,11,12,17] Studying the effects of the reform with more granular and specialty-specific variables is important because quality of care can change without impacting major outcomes. Overall morbidity and mortality are influenced by many factors, and can remain insulated from the reform's effects due to safeguards such as attending oversight. However, clinically significant practice patterns (eg, surgical resource use) and secondary measures of quality (eg, thoracostomy site infections) might have changed.

Surgical residents and, therefore, surgical patients, might be more affected by duty hour restrictions, given the rigorous training and generally longer working hours.[18] Because trauma is a large component of surgical training, any effects of the policy would be particularly relevant in this field. In this study, our objective was to assess whether the 2011 duty hour reform was associated with changes in trauma care at 2 levels of specificity: first, in commonly studied measures of overall morbidity and mortality; and second, in more specific quality and safety measures. We selected these 2 levels based on our hypothesis that major outcomes might not reflect all changes in quality and safety.

METHODS

Data collection

After IRB approval, we collected data from the Trauma Registry of Rhode Island Hospital, a database containing information on all patients admitted to the trauma service at our institution. We included only those patients admitted within 2 years before and after the implementation of the ACGME guidelines on July 1, 2011 (July 1, 2009 through June 30, 2013). Data were collected from the entirety of each patient's admission, including demographic data, all injuries and diagnoses, all procedures and interventions, outcomes, and follow-up.

Patients were divided into 2 groups: admissions before implementation of the 2011 Common Program Requirements (pre-reform: July 1, 2009 to June 30, 2011) and after implementation (post-reform: July 1, 2011 to June 30, 2013).

Variables studied

We chose to study 10 secondary measures of quality and practice patterns a priori from the Trauma Registry of Rhode Island Hospital that are considered good markers of clinical judgment and performance. We included the following variables: total number of procedures per admission, number of operating room (OR) visits per admission, number of missed injuries per admission, number of consults per admission, rate of repeat central lines, rate of empyema after chest tube placement, and the following rates of complications after laparotomy: total parenteral nutrition (TPN), peritoneal abscess, organ/space infection, and unplanned reopening.

Our institutional trauma registry collects procedural data in procedure codes specified by ICD-9-CM. This coding scheme includes all bedside and OR interventions. Subgroup analysis on the number of ICD-9-CM procedures per patient was performed with Injury Severity Score (ISS) as an independent variable to address any potential confounding effects. Subgroup analysis on this variable was also performed by procedure type. All procedures were categorized in 1 of 4 groups using the 2015 ICD-9-CM Procedure Classes Tool, created by the AHRQ. The 4 groups were minor diagnostic (bedside, eg, imaging study), minor therapeutic (bedside, eg, chest tube placement), major diagnostic (OR, eg, staging laparotomy), and major therapeutic (OR, eg, exploratory laparotomy).

We measured 4 complications after laparotomy by including patients receiving exploratory laparotomy (ICD-9-CM code 54.11) and identifying those with subsequent TPN (99.15), percutaneous abdominal drain (54.91), or organ/space infection (collected by registry). Unplanned reopening of laparotomy was identified as those patients with more than one exploratory laparotomy, but without abdominal negative pressure wound therapy (collected by registry) coded between the 2 procedures. Although TPN administration is not itself a complication, we considered it a surrogate indicator of complications and morbidity. At our institution, enteral feeding is begun with nearly all patients after laparotomy unless there is a