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Hospital markup and operation outcomes in the United States



Faiz Gani, MBBS,^a Aslam Ejaz, MD, MPH,^b Martin A. Makary, MD, MPH,^{a,c} and Timothy M. Pawlik, MD, MPH, PhD,^a Chicago, IL, and Baltimore, MD

Background. Although the price hospitals charge for operations has broad financial implications, hospital pricing is not subject to regulation. We sought to characterize national variation in hospital price markup for major cardiothoracic and gastrointestinal operations and to evaluate perioperative outcomes of hospitals relative to hospital price markup.

Methods. All hospitals in which a patient underwent a cardiothoracic or gastrointestinal procedure were identified using the Nationwide Inpatient Sample for 2012. Markup ratios (ratio of charges to costs) for the total cost of hospitalization were compared across hospitals. Risk-adjusted morbidity, failure-to-rescue, and mortality were calculated using multivariable, hierarchical logistic regression.

Results. Among the 3,498 hospitals identified, markup ratios ranged from 0.5–12.2, with a median markup ratio of 2.8 (interquartile range 2.7–3.9). For the 888 hospitals with extreme markup (greatest markup ratio quartile: markup ratio >3.9), the median markup ratio was 4.9 (interquartile range 4.3–6.0), with 10% of these hospitals billing more than 7 times the Medicare-allowable costs (markup ratio \geq 7.25). Extreme markup hospitals were more often large (46.3% vs 33.8%, $P < .001$), urban, nonteaching centers (57.0% vs 37.9%, $P < .001$), and located in the Southern (46.4% vs 32.8%, $P < .001$) or Western (27.8% vs 17.6%, $P < .001$) regions of the United States. Of the 639 investor-owned, for-profit hospitals, 401 hospitals (62.8%) had an extreme markup ratio compared with 19.3% ($n = 452$) and 6.8% ($n = 35$) of nonprofit and government hospitals, respectively. Perioperative morbidity (32.7% vs 26.4%, $P < .001$) was greater at extreme markup hospitals.

Conclusion. There is wide variation in hospital markup for cardiothoracic and gastrointestinal procedures, with approximately a quarter of hospital charges being 4 times greater than the actual cost of hospitalization. Hospitals with an extreme markup had greater perioperative morbidity. (Surgery 2016;160:169-77.)

From the Department of Surgery,^a Johns Hopkins University School of Medicine, Baltimore, MD; Department of Surgery,^b University of Illinois Hospital and Health Sciences System, Chicago, IL; and Department of Health Policy and Management,^c Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

OPERATIVE CARE is one of the most expensive elements of the U.S. health care system, accounting for more than \$400 billion annually, and these costs are expected to increase and outpace economic

growth during the next decade.^{1,2} The price of operative care charged by a hospital has broad financial implications for society. Aside from government insurance programs and a few regulated state markets, contracted payers often remunerate hospitals based on a previously agreed upon discount, and the remaining costs are passed on to beneficiaries in the form of more expensive health insurance premiums. As a result, hospital charges affect insured individuals and businesses. Patients receiving care outside of insurance (the uninsured or those with high-deductible insurance plans) are affected even more directly, because their bills do not have the flat discounts of contracted payers.

Hospitals often set prices using a chargemaster, a software that can apply several factors to the

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Reprint requests: Timothy M. Pawlik, MD, MPH, PhD, Professor of Surgery and Oncology, Chief, Division of Surgical Oncology, John L. Cameron Professor of Alimentary Surgery, Department of Surgery, Johns Hopkins Hospital, 600 N. Wolfe Street, Block 665, Baltimore, MD 21287. E-mail: tpawlik1@jhmi.edu.

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markup of a bill.^{3,4} Chargemaster rates are established by each hospital and with the exception of rates applied in Maryland hospitals, are not subject to any federal or state regulations.⁴ Consequently, chargemaster rates for certain hospitals are often several times greater than the Medicare-allowable costs of providing care.³⁻⁵ In fact, a recent report by Bai et al³ demonstrated that the 50 most expensive hospitals in the United States were billing approximately 10 times the Medicare-allowable costs and >3 times the national average. Furthermore, Melnick et al⁶ demonstrated that despite initiatives to decrease spending, hospital charges have continued to increase steadily throughout the past few years, suggesting that additional efforts are needed to address medical price inflation.

Despite the large sums of money spent each year to cover health care expenditures, the quality of care within the United States ranks low.^{7,8} Given this, health care providers are increasingly focused on improving the value of care, defined by the outcomes achieved per dollar spent.⁹ Recent evidence, however, suggests a mismatch between current policies and the value of care provided.^{2,10,11} For example, in a study of patients undergoing abdominal operation at a large tertiary care hospital, Knechtle et al¹¹ demonstrated that under current models of payment and pricing, hospitals were able to bill more and subsequently generate greater profits from patients who developed postoperative complications. In addition, in a separate study comparing high- and low-cost hospitals, White et al¹² reported a greater postoperative mortality as well as a greater incidence of postoperative complications among patients treated at high-cost hospitals. Although the current literature highlights important areas for reform, existing studies are limited because they focus on a subset of Medicare beneficiaries and therefore, may not apply to broader practices of hospital billing.^{13,14} The few studies evaluating all payer data are limited to a single institution or region.^{6,13} Given this, we designed a study using a nationally representative, all-payer dataset to evaluate variation in hospital billing practices and to assess whether hospital markup was associated with operative outcomes.

METHODS

Data sources and study population. This cross-sectional, retrospective study was performed in August 2015 using data from the Nationwide Inpatient Sample (NIS) for 2012. Collected and maintained under the Agency for Healthcare Research and Quality's Healthcare Cost and

Utilization Project (AHRQ-HCUP), the NIS is the largest inpatient, all-payer database in the United States. Per year, the dataset includes information from >7 million inpatient discharges, collected from all hospitals participating in the HCUP.¹⁵ Using a stratified sampling methodology, the NIS is a 20% representative sample of all inpatient visits in the United States.¹⁵

We identified patients 18 years or older undergoing an elective cardiothoracic or gastrointestinal procedure using *International Classification of Disease, Ninth Revision, Clinical Manifestation* (ICD-9-CM) procedure codes. Specifically, these procedures included coronary artery bypass grafting, valve replacement, lung resections, pancreatic resections, liver resections, colectomy, gastric resections, and esophagectomy. To ensure homogeneity of the patient population, patients undergoing any other concomitant procedure (eg, coronary artery bypass grafting with valve replacement) or operations performed on an emergent basis were excluded from the study population. Patient comorbidity was classified according to the Charlson Comorbidity Index (CCI), categorizing patients into 5 groups (CCI 0, 1, 2, 3, and ≥ 4). Using a unique hospital identifier collected from the annual American Hospital Association survey, individual hospitals were identified for additional comparison. Hospital-level variables collected within the dataset included hospital teaching status, hospital bed size, hospital ownership/control, and geographical as well as rural versus urban location. Hospital bed size was categorized using specific cut offs for hospital region and teaching status, and hospital control/ownership was categorized as government; private; not-for-profit; and private, investor-owned.^{16,17}

Annually, each hospital submits an all-payer hospital cost report to Medicare. This report contains data pertaining to hospital charges, net revenues, expenses, and payer mix. These data are collected by the Healthcare Cost Report Information System for Medicare and used by the AHRQ-HCUP to calculate a hospital-specific cost-to-charge ratio. Specifically, the charges collected represent the total amount charged for an episode of inpatient care inclusive of operative room, anesthesia, and other charges associated with the postoperative in-hospital course, while professional fees and noncovered charges are excluded. Using this cost-to-charge ratio, a markup ratio ($[\text{MR}] = 1/\text{cost-to-charge ratio}$) was calculated for each hospital representing the ratio between the costs of the hospitalization to the amount that was charged (ie, the amount that was billed by a given

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