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CLINICAL—ALIMENTARY TRACT

Thirty-Day Readmission Among Patients With Non-Variceal Upper Gastrointestinal Hemorrhage and Effects on Outcomes

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BACKGROUND & AIMS: We aimed to determine the rate of hospital readmission within 30 days of non-variceal upper gastrointestinal hemorrhage and its impact on mortality, morbidity, and health care use in the United States. **METHODS:** We performed a retrospective study using the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project Nationwide Readmission Database for the year 2014 (data on 14.9 million hospital stays at 2048 hospitals in 22 states). We collected data on hospital readmissions of 203,220 adults who were hospitalized for urgent non-variceal upper gastrointestinal hemorrhage and discharged. The primary outcome was rate of all-cause readmission within 30 days of discharge. Secondary outcomes were reasons for readmission, readmission mortality rate, morbidity (shock and prolonged mechanical ventilation) and resource use (length of stay and total hospitalization costs and charges). Independent risk factors for readmission were identified using Cox regression analysis. **RESULTS:** The 30-day rate of readmission was 13%. Only 18% of readmissions were due to recurrent non-variceal upper gastrointestinal bleeding. The rate of death among patients readmitted to the hospital (4.7%) was higher than that for index admissions (1.9%) ($P < .01$). A higher proportion of readmitted patients had morbidities requiring prolonged mechanical ventilation (1.5%) compared with index admissions (0.8%) ($P < .01$). A total of 133,368 hospital days was associated with readmission, and the total health care in-hospital economic burden was $30.3 million (in costs) and $108 million (in charges). Independent predictors of readmission were Medicaid insurance, higher Charlson comorbidity score, lower income, residence in a metropolitan area, hemorrhagic shock, and longer stays in the hospital. Older age, private or no insurance, upper endoscopy, and prolonged mechanical ventilation were associated with lower odds for readmission. **CONCLUSIONS:** In a retrospective study of patients hospitalized for non-variceal upper gastrointestinal hemorrhage, 13% are readmitted to the hospital within 30 days of discharge. Readmission is associated with higher mortality, morbidity, and resource use. Most readmissions are not for recurrent gastrointestinal bleeding.

Keywords: AHRQ Database; Mortality; Non-variceal Upper Gastrointestinal Hemorrhage; Readmission.

Non-variceal upper gastrointestinal hemorrhage is the most common gastrointestinal emergency that leads to hospital admission. In the United States alone it is responsible for close to 300,000 admissions per year with an associated cost of more than $2 billion dollars annually.[1,2] Because of advances in endoscopic therapy and overall medical care, in-hospital mortality associated with non-variceal upper gastrointestinal hemorrhage has been steadily decreasing and was estimated to be 2.1% in 2009 in the United States.[2] Although validated non-endoscopic prognostic scores, such as the AIM65 score and the Glasgow Blatchford score, can help in the early identification of patients at high risk for mortality,[3] rebleeding, or endoscopic therapy,[4] much less is known about the rate of, reasons for, and predictors of hospital readmission after an episode of non-variceal upper gastrointestinal hemorrhage.

In the United States, a significant change in health care economics has been taking place since 2014, with resulting changes in health care reimbursement models. The center of Medicare and Medicaid is increasingly moving away from fee-for-service models of reimbursement in favor of alternative models such as bundled payments for episodes of care and value-based reimbursement. A goal of US Department of Health and Human Services is to have 30% and 50% of Medicare payments in alternative payment models by the end of 2016 and 2018, respectively.[5] As a result, quantifying hospital readmission rate after an episode of non-variceal upper gastrointestinal hemorrhage and measuring its impact on patient outcomes and resource use has become a key step in both improving treatment outcomes and health care reimbursement. Emergency 30-day readmissions are common, occurring after 7%–25% of all patient discharges in various medical conditions[6–8]; are costly[9]; and may be preventable.[6]

To date, 2 regional studies conducted outside the United States have addressed 30-day readmission among patients with non-variceal upper gastrointestinal hemorrhage. Rahme et al[10] used the Quebec insurance registry (Regie de l'Assurance Maladie du Quebec) to calculate the in-hospital mortality, 1-year mortality, and 30-day readmission rate

Abbreviations used in this paper: ICD9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*; NRD, Nationwide Readmission Database.

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WHAT YOU NEED TO KNOW

BACKGROUND AND CONTEXT

No national study has measured 30-day all cause readmission among patients admitted with non-variceal upper gastrointestinal hemorrhage.

NEW FINDINGS

The 30-day readmission rate is 13% and was most frequently due to recurrent bleeding. Readmission is associated with increased mortality, morbidity, and resource utilization.

LIMITATIONS

The authors used the NRD database, which relies on ICD-9 codes, does not capture data on medications, lab values, or out of state readmissions.

IMPACT

Several independent predictors of non-variceal upper gastrointestinal hemorrhage 30-day readmission can potentially be modified or used to define high-risk populations for resource allocation.

among patients with non-variceal upper gastrointestinal hemorrhage. The authors found that the 30-day readmission rate was 487 per 100 person-years. In contrast, Strömdahl et al[11] studied 30-day non-variceal upper gastrointestinal hemorrhage readmission in a single institution in Sweden from 2009 to 2011. They found that the 30-day hospital readmission rate was 16.5% and that 90% of readmissions were due to rebleeding. No nationally representative study in the United States has addressed 30-day hospital readmission after an episode of non-variceal upper gastrointestinal hemorrhage. The aim of this study is to determine the 30-day readmission rate and its impact on patient outcome and resource use among patients admitted with non-variceal upper gastrointestinal hemorrhage in the largest publicly available inpatient database in the United States.

Methods

Data Source

This is a retrospective cohort study using the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project Nationwide Readmission Database (NRD) for the year 2014. The NRD is the largest publicly available all-payer inpatient health care readmission database in the United States. In 2014, the database contained data from 14.9 million hospital stays at 2,048 hospitals in 22 states.[12] It is designed as a stratified probability sample to be representative of all nonfederal acute care inpatient hospitalizations nationwide. Briefly, hospitals are stratified according to ownership/control, number of beds, teaching status, urban/rural location, and geographic region. A 20% probability sample of all hospitals within each stratum is then collected. Those hospital discharges are recorded, and information about patients' demographics, principal and secondary diagnoses, vital status at discharge, readmission and resource use including length of stay, procedures performed, and total hospitalization costs and charges are entered into the NRD. Each discharge is then weighted (weight = total number of discharges from all acute care hospitals in the United States divided by the number of discharges included in the 20% sample) to make the NRD nationally representative.

The NRD contains both patient- and hospital-level information. Up to 25 discharge diagnoses and 15 procedures are collected for each patient using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD9-CM). The NRD has been previously used to provide reliable estimates of the burden of gastrointestinal diseases.[13,14]

Study Population

The ICD9-CM system does not have a unified code for non-variceal upper gastrointestinal hemorrhage. We previously reviewed published manuscripts on the topic and identified a reliable algorithm to identify patients with non-variceal upper gastrointestinal hemorrhage, which we used in previous studies (Supplemental Material).[15–17] Patients with a principal diagnosis of non-variceal upper gastrointestinal hemorrhage were included in the study. Patients were excluded if they were younger than 18 years or if the admission was elective. Because the NRD captures admission purely on a calendar year basis (ie, January 1 through December 31) without a link to the previous or following year, index hospitalization discharges occurring in the month of December were also excluded. Patients who bled after admission to the hospital were not included in the study. The institutional review board of University of South Carolina deemed the research project exempt from approval because it is a retrospective review of already collected, de-identified data.

Study Outcomes

The primary outcome was 30-day all-cause hospital readmission. Each patient included in the NRD is assigned a unique database identification number. This number can be used to identify all admissions within the state for each patient during the calendar year 2014. A readmission was defined as any non-traumatic admission for any principal diagnosis within 30 days of the index admission. In the event that patients had multiple readmissions within 30 days of discharge, only the first readmission was counted. Patients who died in the index admission were excluded from the denominator.

The secondary outcomes were (a) in-hospital mortality rate for index admissions; (b) 30-day mortality rate for index admissions; (c) the 5 most common principal diagnoses for readmission; (d) readmission in-hospital mortality rate; (e) resource use associated with readmission: length of hospital stay, total hospitalizations costs, and charges; and (f) independent risk factors for readmission.

Definition of Variables

We used NRD variables to identify each patient's age (in years), sex, median household income for patient's zip code ($1–$38,999, $39,000–$47,999, $48,000–$62,999, and $63,000 or more), primary expected payer (Medicare, Medicaid, private insurance, and uninsured), patient residence (large metropolitan areas with at least 1 million residents, small metropolitan areas with less than 1 million residents, micropolitan areas (nonurban residual), and not metropolitan or micropolitan),