Rehospitalization to primary versus different facilities following abdominal aortic aneurysm repair

Richard S. Saunders, MD,[a] Sara Fernandes-Taylor, PhD,[a] Amy J. H. Kind, MD, PhD,[b,d] Travis L. Engelbert, MD,[a] Caprice C. Greenberg, MD, MPH,[a] Maureen A. Smith, MD, PhD, MPH,[c] Jon S. Matsumura, MD,[a] and K. Craig Kent, MD,[a] *Madison, Wisc*

Objective: **Reducing readmissions represents a unique opportunity to improve care and reduce health care costs and is the focus of major payers. A large number of surgical patients are readmitted to hospitals other than where the primary surgery was performed, resulting in clinical decisions that do not incorporate the primary surgeon and potentially alter outcomes. This study characterizes readmission to primary vs different hospitals after abdominal aortic aneurysm (AAA) repair and examines the implications with regard to mortality and cost.**

Methods: **Patients who underwent open or endovascular aneurysm repair for AAA were identified from the Centers for Medicare and Medicaid Services Chronic Conditions Warehouse, a random 5% national sample of Medicare beneficiaries from 2005 to 2009. Outcomes for patients who underwent AAA repair and were readmitted within 30 days of initial discharge were compared based on readmission location (primary vs different hospital).**

Results: **A total of 885 patients underwent AAA repair and were readmitted within 30 days. Of these, 626 (70.7%) returned to the primary facility, and 259 (29.3%) returned to a different facility. Greater distance from patient residence to the primary hospital was the strongest predictor of readmission to a different facility. Patients living 50 to 100 miles from the primary hospital were more likely to be readmitted to a different hospital compared with patients living <10 miles away (odds ratio, 8.50; $P < .001$). Patients with diagnoses directly related to the surgery (eg, wound infection) were more likely to be readmitted to the primary hospital, whereas medical diagnoses (eg, pneumonia and congestive heart failure) were more likely to be treated at a different hospital. There was no statistically significant difference in mortality between patients readmitted to a different or the primary hospital. Median total 30-day payments were significantly lower at different vs primary hospitals (primary, $11,978 vs different, $11,168; $P = .04$).**

Conclusions: **Readmission to a different facility after AAA repair is common and occurs more frequently than for the overall Medicare population. Patients travelling a greater distance for AAA repair are more likely to return to different vs the primary hospital when further care is required. For AAA repair, quality healthcare may be achieved at marginally lower cost and with greater patient convenience for selected readmissions at hospitals other than where the initial procedure was performed. (J Vasc Surg 2014;59:1502-10.)**

Owing in part to the 2010 Patient Protection and Affordable Care Act, improving patient outcomes and providing more cost-effective care is a focus of current efforts in health care research and administration. Accordingly, decreasing 30-day readmission rates represents an opportunity to improve outcomes and lower healthcare costs by appropriately identifying and reducing preventable readmissions. Vascular surgery, encompassing all diagnoses and procedures, has a readmission rate of 23.9%, which is markedly higher than the overall surgical readmission rate of 15.6%.[1] Of the seven categories accounting for more than 30% of potentially preventable readmissions, vascular

From the Wisconsin Surgical Outcomes Research Program (WiSOR), Department of Surgery,[a] Department of Medicine, Geriatrics Division,[b] and Departments of Population Health Sciences, Family Medicine and Surgery,[c] University of Wisconsin School of Medicine and Public Health and the Geriatric Research Education and Clinical Center (GRECC), William S Middleton Hospital, United States Department of Veterans Affairs.[d]

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Reprint requests: K. Craig Kent, MD, H4/710 Clinical Science Center, 600 Highland Ave, Madison, WI 53792-7375 (e-mail: kent@surgery.wisc.edu).

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surgery is the most costly (on a per-patient basis).[2] For this reason, it is important to develop a better understanding of the causes and consequences of readmissions following vascular surgery and the mechanisms that underlie the cost of readmission. Readmission to a facility other than that where the primary procedure was performed is one factor that may lead to increased cost and mortality. Physicians at different hospitals are likely unfamiliar with the patient's intervention and postoperative course. Moreover, a community hospital may not be equipped to care for patients with high complexity. There is a robust literature indicating that survival after complex operations is related to a "failure to rescue" patients from complications rather than the avoidance of postoperative complications.[3,4] That is, the ability of a health system to care for a patient who has a complex postoperative course may be more important than the ability to prevent the initial complications.

Abdominal aortic aneurysms (AAAs) are a significant source of mortality in the United States with ruptured AAAs being the 15th leading cause of death overall.[5] AAA repair represents one of many surgical procedures with a documented positive volume-outcome relationship.[6-9] Consequently, many patients are referred to high-volume centers that offer improved perioperative outcomes, including lower mortality.[10] Unfortunately, the emphasis on regionalization predates current healthcare reform aimed at reducing readmissions. Considering that 13% of patients undergoing AAA repair experience readmission within 30 days[11] and as many as 55% within 1 year,[12] understanding where these patients are readmitted is necessary. Additionally, there is a five-fold increase in mortality within 1 year after surgery (23.4% vs 4.5%) for AAA patients that are readmitted.[11] It is unclear to what extent this may be related to patients' being readmitted to a hospital different from where the primary surgery was performed.

Readmission to the primary vs a different facility has not been systematically studied in any surgical population. Previous evaluations are limited to the rate of different facility rehospitalization without further analysis of the predictors or consequences of this phenomenon. This study evaluates the rates and characteristics of same vs different hospital readmission after AAA repair with particular attention to associated costs and mortality. We hypothesize that readmission to a different hospital is associated with increased cost and mortality among patients undergoing AAA repair.

METHODS

Sample definition. We utilized the Centers for Medicare and Medicaid Services (CMS) Chronic Conditions Warehouse (http://ccwdata.org), a 5% national random sample of Medicare beneficiaries followed over time following sample entry (2004 through 2009). Data included patient demographics and clinical characteristics, Medicare enrollment data, and facility and provider claims. We used International Classification of Diseases, Ninth Clinical Modification (ICD-9-CM) diagnosis codes to identify patients with ruptured or nonruptured AAA, and procedure codes defined endovascular and open aneurysm repair as previously reported (codes available in Supplementary Table I, online only).[11,13] AAA diagnoses without an associated procedure code for repair were excluded as were aortic dissections, thoracic aortic aneurysms, and thoracoabdominal aneurysms (Supplementary Table I, online only). Inclusion required continuous enrollment in Medicare parts A and B for 365 days before primary admission to characterize patient comorbidities, and 60 days following the primary discharge date to examine 30-day readmission cost and mortality. Additional selection criteria per the CMS definition of 30-day readmissions[14] are available in Supplementary Table I (online only). Patients with multiple readmissions within 30 days of primary discharge were counted once, and only the first readmission was included in analysis. Emergent presentation with subsequent referral to another facility is attributed as a readmission to the accepting facility, and treatment under observation status is not counted as a readmission, as per existing CMS readmission policy.[14]

Outcome and explanatory variables. The primary outcome variable is readmission to a different facility within 30 days of discharge following AAA repair. This was coded comparing the facility identification numbers of the primary hospital and readmitting hospitals. We also compared mortality rates between the readmission destinations by examining (1) in-hospital rehospitalization mortality and (2) mortality within 30 days of the date of rehospitalization. Total 30-day rehospitalization payments were calculated by aggregating all paid inpatient, outpatient, facility, and provider claims occurring within 30 days of the date of rehospitalization.

Patient characteristics including age, gender, race (white or nonwhite), Medicaid eligibility, and Medicare disability entitlement were obtained. Rural-Urban Commuting Area (RUCA) codes[15] categorized patient residence as urban, suburban, large town, or rural. Distance from patient residence to the primary hospital was calculated as straight line distance from the center of patient's residence zip code to the address of the primary hospital. Patient mobility was assessed using the first claim date for a mobility assistive device. Additional clinical characteristics included comorbidities (Charlson Index),[16] the CMS Hierarchical Condition Categories (a measure of predicted healthcare utilization),[17] and the number of hospitalizations in the year prior to the qualifying procedure. Other variables included length of stay (LOS), type of repair (open or endovascular), type and number of in-hospital postoperative complications as previously defined,[11] and whether the primary hospital had a medical school affiliation. Initial discharge destination was determined using the CMS discharge status variable in conjunction with subsequent facility claims for other transitional care settings. Discharge destination was categorized as home, home with home care, skilled nursing facility, or other.