



Measuring Quality of Neurosurgical Care: Readmission Is Affected by Patient Factors

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■ **OBJECTIVE:** The Hospital Readmission Reduction Program section of the Patient Protection and Affordable Care Act uses readmission rates as a proxy for measuring quality of care. Multiple studies have demonstrated that readmission rates are highly imprecise proxies for quality of care because readmission rates contain large amounts of statistical noise and are dependent on disease type, insurance type, severity, population, and a multitude of other factors. The current study was conducted to investigate characteristics associated with readmission and the quality of neurosurgical care.

■ **METHODS:** Admissions data were gleaned from the University Health System Consortium database for neurosurgical patient (both cranial and spine) readmissions to assess patient-related factors relating to readmission from January 2011 to December 2014.

■ **RESULTS:** Among 257,212 admissions for neurosurgical disease analyzed, patients with Medicaid and private payers as a primary insurance source had increased rates of readmission (odds ratio for readmission of 1.38 and 1.17, respectively) compared with patients with Medicare or other primary insurers. Patients with greater severity of disease and emergent or urgent admission also had statistically significant rates of readmission.

■ **CONCLUSIONS:** The findings suggest that readmission is affected by patient factors that are beyond the control of treating physicians. These findings also suggest that readmission rates may not be a good proxy for measurement of quality of care in neurosurgical patients.

INTRODUCTION

With the recent decision of the Supreme Court of the United States in *King v. Burwell*, the Patient Protection and Affordable Care Act has been upheld. One of the aims of the Patient Protection and Affordable Care Act is to reduce health care costs while maintaining or increasing health care quality in the nation's hospitals. The methods by which cost reduction is measured are fairly straightforward—fewer dollars spent for treating the same conditions. Cost reduction can, logically, come at the price of decreased quality, which is undesirable for all health care stakeholders. Measuring quality, however, is a different beast altogether. Many studies have been published about how to best monitor and track the quality of health care delivery. As is the case when there are many voices in the discussion, there is considerable controversy.

Patient readmission rates are used by regulatory bodies as a proxy of the quality of health care.¹ The argument is that if care is of sufficient quality, readmission rates would decrease. In fact, the Center for Medicare and Medicaid Services has started to decrease payments to hospitals with readmission rates greater than the national average. Initially, the focus was on a select few disease processes, including pneumonia, congestive heart failure, and myocardial infarction; other conditions, including postoperative complications such as surgical-site infections after coronary bypass graft, orthopedic procedures, and bariatric procedures, are now being included in readmission penalty plans.²

In the United States, there are a wide variety of payer sources for health care expenses. The Federal Government funds a payer system referred to as Medicare in which all citizens and permanent residents older than the age of 65 who have earned sufficient credits in the Federal tax system through at least 10 years of work and for citizens and permanent residents younger than 65 with other specifically defined long-term medical conditions. This program allows for a large percentage of the expenses associated with health care to be paid for by the Federal Government. Medicaid is a health care payment system in which the Federal

Key words

- Insurance payer
- Quality
- Readmission rates
- University Hospital Consortium

Abbreviations and Acronyms

UHC: University Health System Consortium

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Citation: *World Neurosurg.* (2016) 88:21-24.
<http://dx.doi.org/10.1016/j.wneu.2015.12.091>

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

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Government and State Governments provide health care funds for the indigent. The qualifying criteria, covered services, and individual financial responsibility vary from state to state. Private insurers are third-party companies that provide a range of financial coverage for health care costs depending on the amount an individual or corporation pays for the health care services.

To date, the neurosurgical literature on hospital readmissions has been limited. In a report of 30-day readmission after subarachnoid hemorrhage, Singh et al.³ reported a readmission rate of approximately 8%. The data for spine surgery are more plentiful, and reported unplanned readmission rates for patients undergoing lumbar spine surgery in 2012 were 4.4%, according to a query of the American College of Surgeons National Surgical Quality Improvement Program.⁴ This rate is well below the reported numbers of 20% for Medicare patients for all conditions. A report from Kaiser Permanente details the reasons for readmission after instrumented spine surgery. They found a multitude of risk factors associated with 30-day readmission, including deep venous thrombosis, intraoperative durotomy, malignancy, and operative time.⁵ Also, the American Association of Neurological Surgeons National Neurosurgery Quality of Outcomes Database project⁶ is providing our specialty with a method by which we may study and publish the quality of our procedures. This phenomenal undertaking will certainly prove valuable, not only for the current lumbar fusion modules, but for those modules that follow and as an example for other neurosurgical subspecialties.

The purpose of the present report is to investigate readmission rates for neurosurgical conditions in a large, national multipayer database and to compare readmission rates on the basis of variety of patient-dependent factors—disease severity, admission type, and primary insurer.

MATERIALS AND METHODS

The University Health System Consortium (UHC) database was queried for all available neurosurgery cases in a 4-year period between January 2011 and December 2014. The UHC database is composed of data abstracted from academic medical centers across the country and was designed to compare quality measures across health systems. UHC case data including number of readmissions, initial admission status (Elective, Urgent, or Emergent), Admit Severity of Illness (Minor, Moderate, Major, or Extreme), and Primary Payer (Medicare, Medicaid, Private, or Other) was abstracted.

Admit status and admit severity of illness are determined according to guidelines published by the Center for Medicare and Medicaid Services and are coded as follows: Emergency: The patient required immediate medical intervention as a result of severe, life-threatening, or potentially disabling conditions. Generally, the patient was admitted through the emergency department; Urgent: The patient required immediate attention for the care and treatment of a physical or mental disorder. Generally, the patient was admitted to the first available, suitable accommodation; and Elective: The patient's condition permitted adequate time to schedule the availability of a suitable accommodation. Severity of illness is defined according to the Severity of Illness Index, reported and validated by Horn⁷ in 1983. This index uses a mix of 7 variables to determine disease severity and then classifies then accordingly into 4 levels. This is a well-established Index used across hospital systems in

the United States according to Center for Medicare and Medicaid Services guidelines.

Individual case data such as patient age and sex were not available to be abstracted. Readmission rate was calculated and compared on the basis of admission status, illness severity, and primary payer and reported as a percentage. The readmission rate was calculated to control for mortalities; the percent readmission rate is the number of readmissions divided by the number of admissions less mortalities. Subgroup comparison was performed with SPSS (SPSS Inc., version 18, PASW) and statistical comparison performed with the Fisher exact test. Multiple logistic regression was performed with SPSS with results reported as odds ratio, normalized to other nonprivate insurers, minor disease severity, and elective admit status.

RESULTS

Readmission Incidence

A total of 272,019 cases were abstracted. Readmissions were reported in 14,597 cases (5.4%). Mortality was reported in 14,306 cases (5.3%). Mortality-adjusted readmission was then 5.7% (14,306 readmissions among 257,713 patients surviving cases). Readmission rates were different based on payer, severity of illness, and admission status. Readmission rates are summarized in Table 1.

Readmission was reported most frequently in patients with Medicaid as primary payer (6.8%, $P < 0.001$ Fisher exact). Readmission rates were more comparable among patients with other

Table 1. Incidence of Readmission for Neurosurgical Patients Presented According to Primary Payer, Disease Severity, and Admission Status

	Admissions	Readmit, n (%)	Mortalities, n, (%)	Mortality-Adjusted Readmission, %
Payer				
Medicaid	47,576	3087 (6.5)	2600 (5.5)	6.8*
Medicare	86,549	4213 (4.9)	6228 (7.2)	5.2
Private	120,147	6461 (5.4)	3962 (3.3)	5.6
Other	17,747	836 (4.7)	1516 (8.5)	5.2
Severity				
Minor	84,699	4697 (5.5)	291 (0.3)	5.6
Moderate	100,573	5595 (5.6)	1379 (1.4)	5.6
Major	62,090	3337 (5.4)	6064 (9.8)	6.0
Extreme	24,657	968 (3.9)	6572 (27)	5.4
Admit status				
Elective	150,705	7373 (4.9)	700 (0.5)	4.9
Urgent	37,755	2133 (5.6)	2966 (7.9)	6.1
Emergent	83,559	5091 (6.1)	10,640 (13)	7.0*

Numbers are presented as total numbers (n) and percentages.

* $P < 0.05$.

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