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## Readmissions after Carotid Artery Revascularization in the Medicare Population

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### Abstract

**Background**—In appropriately selected patients with severe carotid stenosis, carotid revascularization reduces ischemic stroke. Prior clinical research has focused on the efficacy and safety of carotid revascularization, but few investigators have considered readmission as a clinically important outcome.

**Objectives**—To examine frequency, timing, and diagnoses of 30-day readmission following carotid revascularization; to assess differences in 30-day readmission between patients undergoing carotid endarterectomy (CEA) and carotid artery stenting (CAS); to describe hospital variation in risk-standardized readmission rates (RSRR); and to examine whether hospital variation in procedural choice (CEA vs. CAS) was associated with differences in RSRRs.

**Methods**—We used Medicare fee-for-service administrative claims data to identify acute care hospitalizations for CEA and CAS from 2009–2011. We calculated crude 30-day all-cause hospital readmissions following carotid revascularization. To assess differences in readmission

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after CAS compared with CEA, we used Kaplan-Meier survival curves and fitted mixed-effect logistic regression. We estimated hospital RSRRs using hierarchical generalized logistic regression. We stratified hospitals into 5 groups by their proportional CAS use and compared hospital group median RSRRs.

**Results**—Of 180,059 revascularizations from 2,287 hospitals, CEA and CAS were performed in 81.5% and 18.5% of cases, respectively. The unadjusted 30-day readmission rate following carotid revascularization was 9.6%. Readmission risk after CAS was higher than after CEA. There was modest hospital-level variation in 30-day RSRRs (Median: 9.5%, Range: 7.5%–12.5%). Variation in proportional use of CAS was not associated with differences in hospital RSRR (range of median RSRR across hospital quartiles: 9.49%–9.55%,  $P$  0.771).

**Conclusions**—Almost 10% of Medicare patients undergoing carotid revascularization were readmitted within 30-days of discharge. Compared with CEA, CAS was associated with higher readmission risk. However, hospitals' RSRR did not differ by their proportional CAS use.

### Keywords

Carotid artery stenosis; hospital readmission; carotid artery stenting; carotid endarterectomy

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### Introduction

Carotid revascularization is a commonly performed class of vascular interventions that in appropriately selected patients reduces the risk of ipsilateral stroke (1). Prior research has focused on the safety and efficacy of carotid revascularization, but few investigators have considered short term readmission as a clinically important outcome (2). However, the potential importance of readmissions following carotid revascularization has increased dramatically with the development of a measure of hospitals' 30-day risk-standardized readmission rates (RSRR) following vascular procedures (3), with implications for potential financial penalties for hospitals with excess readmissions.

At present, many aspects of readmissions following carotid revascularization are poorly understood. Specifically, the timing and reasons for readmission as well as the extent of variation in hospitals' 30-day readmission rates have not been described. Furthermore, like many vascular procedures, carotid revascularization can be accomplished through an open or endovascular approach (carotid endarterectomy [CEA] and carotid artery stenting [CAS], respectively). Although prior research has shown that patients undergoing CAS are at increased risk of readmission compared with patients undergoing CEA (2), it is not known whether differences in hospitals' proportional use of CAS among all carotid revascularization procedures are associated with differences in hospital 30-day readmission rates.

To address these gaps in knowledge, we used administrative claims data to identify readmissions occurring within 30 days of hospitalization in which a carotid revascularization procedure was performed. We examined the timing and diagnoses associated with readmission and characterized variation in risk-standardized readmission rates (RSRRs) across hospitals. Furthermore, we assessed whether readmission rates varied by the choice

of the revascularization strategy used (CAS vs. CEA) and whether hospitals' 30-day RSRRs differed by their proportional use of CAS among all carotid revascularization procedures.

## Methods

We used Medicare fee-for-service administrative claims data to identify hospitalizations with an associated carotid revascularization procedure performed between January 2009 and December 2011. We identified our patients using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes or Current Procedure Terminology (CPT) codes, previously reported by the Center for Medicare & Medicaid Service (CMS) vascular procedure readmission measure (3). As with this measure, our study sample consisted of patients who underwent either CEA (ICD-9-CM codes: 00.61, 00.63, 00.64, 39.72, 39.74; or CPT codes: 37215, 37216, 0075T) or CAS (ICD-9-CM codes: 38.02, 38.12, 38.32, 38.42 or CPT codes: 35201, 35005, 35231, 35301, 35701, 34001). Whether or not patients were symptomatic (i.e. had symptoms attributable to their carotid disease) was identified using the following ICD-9-CM codes previously reported in literature: 362.3(0–7), 362.84, 433.11, 433.31, 434.01, 434.91, 435.(0–3,8,9), and 781.4 (2,4,5). The primary outcome of interest was hospital readmission within 30-days of discharge from a hospitalization during which a carotid revascularization procedure had been performed. Among patients who had been readmitted, we examined the timing of the readmission by day after discharge (0–30). We categorized readmission diagnoses using the CMS condition category (CC) codes to group patients' principal discharge diagnoses. Each of the 189 CMS CCs describes a disease entity or medical condition. However, because more than 90% of these CCs contributed less than 1% of all readmissions, we further consolidated the 189 CMS CCs into 30 modified CCs. The categorization of CCs is described in Supplementary Tables 1 & 2.

## Statistical Analyses

We used descriptive statistics to illustrate baseline characteristics. We compared differences in baseline characteristics between CEA and CAS patients using the Mantel-Haenszel chi-square test and Student's T test, as appropriate. We calculated crude readmission rates following carotid revascularization procedures by dividing the number of patients readmitted within the 30-day period following carotid revascularization procedure by the total number of patients undergoing carotid revascularization. To examine the timing of readmission following carotid revascularization, we calculated the proportion of readmissions during each day over the 30-day period. We also identified the ten most common diagnoses responsible for readmission by modified CCs and presented their distribution over the following consecutive time periods after hospital discharge: 0–7 days, 8–15 days and 16–30 days, reflecting the time periods in which follow-up visits to ambulatory care providers frequently occur.

## Procedure-specific readmission rates: CAS vs. CEA

To assess the difference in readmission rates between patients undergoing CEA versus CAS, we plotted Kaplan-Meier readmission-free survival curves and fitted a generalized estimating equation (GEE) logistic regression model. These models adjusted for patient and

hospital characteristics. In these models, we considered all variables included in the models as fixed effects except the hospital variable, which was considered as a random effect to account for within hospital correlation.

To account for baseline differences between CEA and CAS, we used propensity score matching to create new matched data set (N =64,238) based on age, gender, race, symptomatic status and other comorbidities included in previous GEE model. After matching, the standardized difference between the two groups did not exceed 10% for any variables (See Supplementary Table 3), indicating successful matching in respect of the chosen matching variables. We then fit a GEE model using this propensity matched cohort.

### **Hospital-specific Risk Standardized Readmission Rates (RSRRs)**

We estimated hospital-specific 30-day risk standardized readmission rates (RSRRs) using a hierarchical mixed-effect logistic regression model adjusting for demographics and comorbidities. To account for within-hospital correlation, we estimated a random intercept for each hospital by including the hospital variable as a random effect variable. We estimated the hospital-specific RSRR by calculating the ratio of the “predicted” 30-day readmission rate within the hospital to the “expected” 30-day readmission rate within that hospital. We used this ratio to standardize an unadjusted national average of readmission rates following carotid revascularization procedures. We estimated the hospital “predicted” readmission rate using the random intercept specific to that hospital and the population mix within that hospital. We calculated the hospital “expected” readmission rate from an average hospital intercept, calculated from our sample of hospitals and the population mix of that specific hospital.

We also examined differences in hospital-specific RSRRs by the utilization of carotid revascularization strategy. In order to obtain a stable estimate of hospitals’ proportional use of CAS, we limited this analysis to hospitals that performed at least 25 carotid revascularization procedures. To examine whether hospital RSRR varied by the proportion of revascularization cases performed using CAS, we stratified hospitals into five groups by their proportional use of CAS among all carotid revascularization procedures (0%, 0–10%, 10–20%, 20–30%, >30%). We utilized descriptive statistics to summarize hospital-specific RSRRs within each hospital group. We then compared the medians of these five hospital groups using a Kruskal-Wallis test. The study was approved by the Human Investigation Committee of Yale University School of Medicine. We used SAS version 9.3 (SAS Institute, Cary, NC) for statistical analyses and defined statistical significance as two-tailed  $P < 0.05$ .

## **Results**

We identified 180,059 patients for 168,323 patients (93.2% patients with single carotid intervention and 6.8% with >1 carotid intervention) from 2,287 hospitals undergoing carotid revascularization procedures performed between January 2009 and December 2011. Of these procedures, 81.5% (146,831/180,059) underwent CEA and 18.5% (33,228/180,059) underwent CAS. The mean age of our cohort was 76.3 years and 93% of included patients were Caucasians (Table 1). Symptomatic carotid stenosis, diabetes, hypertension and

congestive heart failure were present in 10%, 43%, 89%, and 20% of our study population, respectively. 43% of our patients had other peripheral vascular diseases and 18% had chronic kidney disease.

The unadjusted 30-day readmission rate following carotid revascularization was 9.6% (17,202/180,059). One quarter of all readmissions occurred within 3 days of hospital discharge, 44.3% occurred within the first 7 days of discharge, and 67.8% occurred within the first 14 days of discharge (Figure 1). The unadjusted 30-day mortality rate following carotid revascularization was 1.2% (2,247/180,059). The reasons for readmission following carotid revascularization procedures were broad (Figure 2), with the ten most common readmission diagnoses contributing only 50.0% of all 30-day readmissions. The most common reasons for readmission were complications of care (8.6%), heart failure (6.6%) and pneumonia (including aspiration pneumonitis) (5.2%). The most common complications of care included hematoma formation (2.3%), iatrogenic stroke/intracranial hemorrhage, (0.8%), and non-CNS bleeding (0.5%). Additionally, cerebral complications including ischemic stroke, TIA and cerebral hemorrhage were collectively responsible for 10.7% of readmissions. Some readmission diagnoses varied over time (Figure 3). For instance, complications of care, heart failure and acute stroke were more often encountered during the first week following hospitalization. In contrast, other peripheral vascular diseases, chronic angina and coronary artery disease were more common in the third and fourth week following hospitalization.

#### **Procedure-specific readmission rate: CAS vs. CEA**

The characteristics of patients undergoing CEA and CAS procedures varied modestly (Table 1). The mean age of CAS and CEA patients was 76.1 years and 76.3 years, respectively. Male patients and Caucasian patients were more likely to undergo CEA than CAS. A higher proportion of patients undergoing CEA had diabetes, hypertension and coronary atherosclerosis ( $P < 0.001$  for all). In contrast, a higher proportion of CAS patients had symptomatic carotid stenosis, congestive heart failure, coronary syndrome, other peripheral vascular diseases and chronic renal failure ( $P < 0.001$  for all). Crude 30-day readmission rates following CEA and CAS were 9.0% (13,222/146,831) and 12.0% (3,980/33,228), respectively. In multivariable analysis, the adjusted risk of readmission was significantly higher among patients undergoing CAS compared with patients undergoing CEA (Adjusted odds ratio: 1.13, 95% confidence interval: 1.08 – 1.18,  $P < 0.001$ ) (Central Illustration). Within the propensity matched subgroup, CAS patients also had significantly higher rate of readmission compared to patients undergoing CEA (Adjusted odds ratio: 1.18, 95% confidence interval: 1.07 – 1.23,  $P < 0.001$ ).

Symptomatic patients were significantly more likely to be readmitted compared with asymptomatic patients (Adjusted odds ratio: 1.18, 95% confidence interval: 1.12 – 1.24,  $P < 0.001$ ) (Figure 4). Other notable predictors of readmissions were age  $> 65$  years (Adjusted odds ratio: 1.01, 95% confidence interval: 1.01 – 1.02,  $P < 0.001$ ), female gender (Adjusted odds ratio: 1.12, 95% confidence interval: 1.08 – 1.15,  $P < 0.001$ ) and Caucasian race (Adjusted odds ratio: 1.12, 95% confidence interval: 1.06 – 1.19,  $P < 0.001$ ).

In stratified analyses, compared to CEA, CAS had higher rates of readmission in both patients with symptomatic (Adjusted odds ratio: 1.24, 95% confidence interval: 1.12 – 1.37,  $P < 0.001$ ) and asymptomatic (Adjusted odds ratio: 1.10, 95% confidence interval: 1.05 – 1.14,  $P < 0.001$ ) carotid stenosis. An interaction term (symptomatic status\*procedural approach) was not significant. Similarly, compared to CEA, CAS had higher rates of readmission among patients older than 80 years (Adjusted odds ratio: 1.12, 95% confidence interval: 1.04 – 1.20,  $P < 0.001$ ), younger than 80 years (Adjusted odds ratio: 1.12, 95% confidence interval: 1.07 – 1.18,  $P < 0.001$ ), male patients (Adjusted odds ratio: 1.13, 95% confidence interval: 1.07 – 1.19,  $P < 0.001$ ), female patients (Adjusted odds ratio: 1.13, 95% confidence interval: 1.07 – 1.20,  $P < 0.001$ ), Caucasian race (Adjusted odds ratio: 1.11, 95% confidence interval: 1.06 – 1.16,  $P < 0.001$ ) and Non-Caucasian race (Adjusted odds ratio: 1.25, 95% confidence interval: 1.10 – 1.42,  $P < 0.001$ ).

### Hospital-specific Risk Standardized Readmission Rates (RSRRs)

There was modest hospital-level variation in 30-day RSRRs (Figure 5). The median hospital 30-day RSRR was 9.5% with a range from 7.5% to 12.5% and interquartile range of 9.2% to 10.0%. The use of CAS varied significantly across hospitals (Figure 6). Of the 2,287 hospitals, 1,500 (65.6%) performed more than 25 carotid revascularization procedures and were included in our analysis of hospitals' proportional use of CAS. Variation in proportional use of CAS was not associated with significant differences in hospital RSRR (Median RSRR: Group 1: 9.51%; Group 2: 9.49%; Group 3: 9.49%; Group 4: 9.52%; Group 5: 9.55%;  $P 0.771$ ) (Central Illustration).

### Discussion

Among Medicare patients undergoing carotid revascularization, 9.6% were readmitted within 30 days of discharge (2,6–9). A high proportion of readmissions occurred within the first 7 days of hospital discharge, and readmissions were associated with a wide range of principal diagnoses. Furthermore, we observed that patients undergoing CAS were at higher risk of readmission compared with patients undergoing CEA. Yet, hospitals performing a higher proportion of revascularization via CAS did not have higher hospital 30-day RSRRs.

CMS has indicated its intent to publicly report hospitals' 30-day readmission rates for patients undergoing vascular procedures, which includes carotid revascularization procedures (3). A measure of vascular readmissions has been submitted to the National Quality Forum for evaluation, and in the future, hospitals with higher than expected readmissions may be subject to payment penalties (3,10). In this context, our analyses of hospital RSRR have important implications. We have characterized both current national performance and the extent of hospital variation in readmissions following carotid revascularization. This information provides a benchmark to which hospitals can evaluate efforts to reduce readmission rates in this population.

We found that although patients undergoing carotid revascularization were disproportionately vulnerable to readmission in the first week after the hospitalization, they remained at substantial risk of readmission throughout the 30-day period. Furthermore, patients were readmitted with a wide range of diagnoses, including cardiovascular,

pulmonary, neurological and renal disorders, as well as complications of care – with no single diagnosis contributing to more than 10% of readmissions. Indeed the ten most common readmission diagnoses were collectively responsible for only half of readmissions. Yet, almost one third of readmission diagnoses were potentially due to procedural complications including cerebral events (10.7%), complication of care (8.6%), acute coronary syndrome (5.0%), and arrhythmias (4.0%). These may represent high yield areas for targeted efforts to reduce readmission. However, the broad range of diagnoses is consistent with the theory that patients experience a period of increased vulnerability to a variety of illnesses following hospital discharge (11,12). As such, interventions targeting a specific readmission diagnosis or time period may be relatively ineffective at reducing readmission rates. Instead, more general strategies leading to improvement in discharge planning, medication reconciliation and early follow up after discharge may better address underlying vulnerabilities in the transitional care process (13).

In our sample of Medicare patients, the readmission rate attributed to stroke and myocardial infarction was 0.5% (883/180,059) and 0.5% (861/180,059), respectively. These rates are lower than rates of similar events reported by comparable randomized controlled trials (Stroke: CREST: 3.2%, SAPPHIRE: 3.3%; Myocardial Infarction: CREST: 1.7%, SAPPHIRE: 4.2%) (1,14). However, direct comparison are challenging given the current study included only events occurring after hospital discharge, while the numbers reported by the clinical trials included events occurring during both the hospitalization and during follow-up. Our results would suggest that the majority of these complications occur during the hospitalization and are relatively rare following discharge.

Consistent with prior investigators, we found that CAS patients were more likely to be readmitted than CEA patients (2). The difference in the risk of readmission is likely driven in part by patient selection. Currently, CEA is the mainstay treatment of symptomatic and asymptomatic carotid artery stenosis, and CAS is typically reserved for patients with comorbidities or anatomy that put them at increased risk for adverse outcomes following CEA (1,15,16). Nevertheless, the risk of readmissions for CAS was higher than CEA even after accounting for observed differences in patient characteristics. This may reflect the limitations of administrative data, but additional research examining whether the excess risk could be mitigated is warranted. CAS is still a relatively new procedure, and the excess risk of readmission may reflect the learning curve associated with incorporating CAS into routine clinical practice. Within a hospital, CAS may be performed by physicians in different specialties with a range of experience and expertise, and researchers have shown that most physicians who perform CAS are low volume operators with variable use of recommended strategies such as the use of embolic protection (17,18). Therefore, there may be an opportunity to improve care by consolidating experience within a smaller team. Such an approach could have ancillary benefits with regards to reducing readmissions by facilitating a smooth transition of care from the inpatient to the outpatient setting.

In our study, we identified a wide range of demographic characteristics (e.g. advancing age, female gender, and Caucasian race) and baseline comorbidities (e.g. symptomatic carotid stenosis, diabetes, congestive heart failure, acute coronary syndrome and ischemic stroke)

associated with increased risk of readmission. These factors may serve as important markers for identifying patients vulnerable to readmission.

In our sample of hospitals, a large proportion of the hospitals did not perform a CAS procedure, and among hospitals that performed both CEA and CAS, the proportional use of CAS varied widely. Of all hospitals that performed carotid revascularization procedures, only 135 (9%) performed more CAS than CEA. Importantly, although readmissions were more common after CAS than CEA, the RSRR of hospitals that used CAS more frequently were comparable to those of hospitals that performed CAS less frequently. This observation suggests that hospitals using CAS more frequently will not necessarily be disadvantaged if and when measures of vascular readmissions are publicly reported and included into payment programs.

Our study has certain limitations. First, we used administrative claims data to identify the sample population and associated comorbidities. Such databases are subject to coding errors, coding differences across providers and institutions, and changes in coding patterns over time (19,20). The accuracy of these coding systems to identify carotid revascularization has not been reported; however, their specificity and positive predictive values to identify comorbidities in cardiovascular patients are generally reasonable (21,22). Second, administrative claims data may not be suitable to identify staged revascularization procedures, as some physicians may elect to perform the carotid repair over two or more consecutive sessions. These planned readmissions were included in our model despite being unrelated to the provided care quality and consequently, may have inflated our readmission estimates. Third, administrative claims data does not provide detailed information about the procedure itself (11,23). Other sources of data such as clinical registries may provide insights into the association of intra-procedural practices and risk of subsequent readmission. Finally, our patient cohort was not randomized to the carotid revascularization strategy and as a result, residual confounds may be present in our observed association despite the use of propensity score matching.

## Conclusions

One in 10 Medicare patients undergoing carotid revascularization are readmitted within 30 days. This current study is in large part foundational, raising awareness among clinicians, hospital administrators, and policy makers regarding this issue, and illustrating the extent to which readmission rates differ by the type of revascularization procedure.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Abbreviations and acronyms

CAS	Carotid Artery Stenting
CC	Condition Category



<b>CEA</b>	Carotid Endarterectomy
<b>CMS</b>	Center for Medicare and Medicaid Service
<b>CPT</b>	Current Procedure Terminology
<b>CREST</b>	Carotid Revascularization: Endarterectomy versus Stenting Trial
<b>GEE</b>	Generalized Estimating Equation
<b>ICD-9-CM</b>	International Classification of Diseases, Ninth Revision, Clinical Modification
<b>RSRR</b>	Risk Standardized Readmission Rate
<b>SAPPHIRE</b>	Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy Trial

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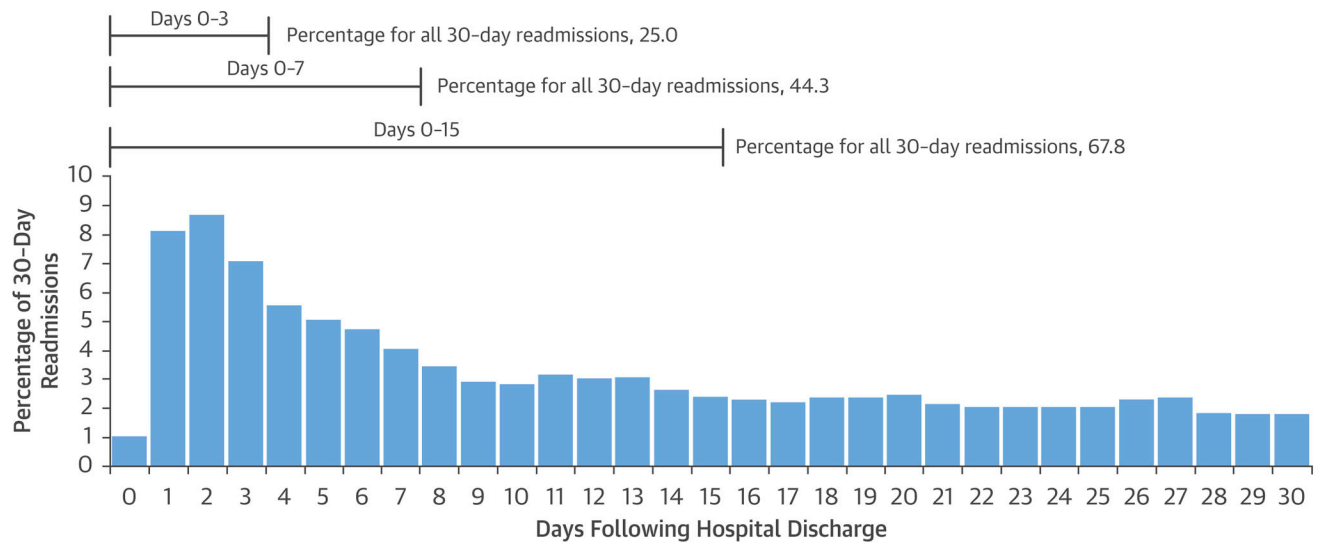
## PERSPECTIVES

### Competency in Medical Knowledge

Almost 10% of Medicare patients undergoing carotid revascularization are readmitted to hospital within 30 days of discharge for a wide range of conditions, and most occur within 7 days after discharge. Carotid artery stenting is associated with higher 30-day readmission rates than endarterectomy.

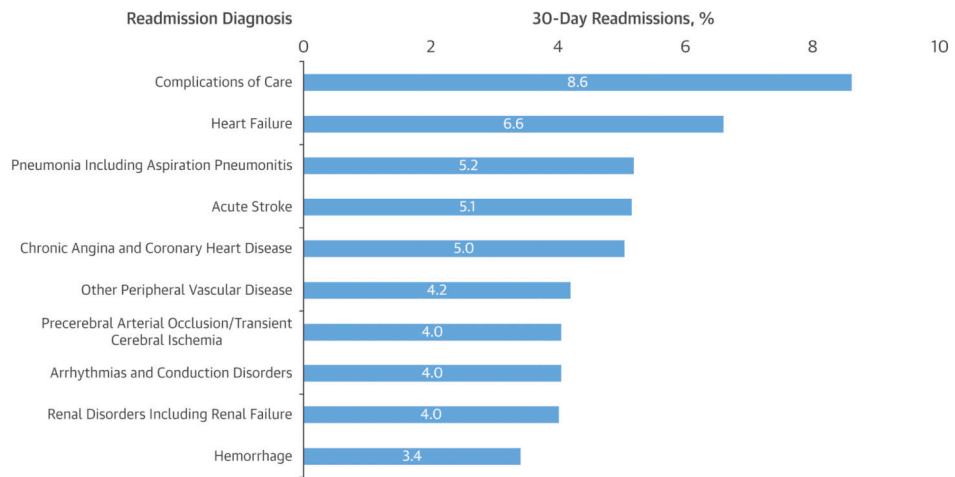
### Translational Outlook

Further investigation is warranted to develop strategies that reduce the need for hospital readmission following carotid revascularizations procedures.



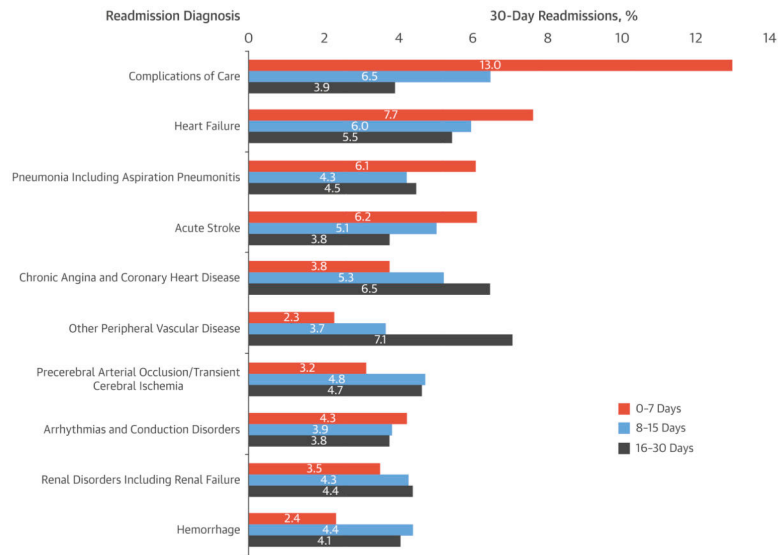
**Figure 1. 30-day readmissions following hospitalizations for carotid revascularization procedures**

Patients undergoing carotid revascularization were disproportionately vulnerable to readmission in the first week after the hospitalization with 44.3% of all admissions occurring within one week of discharge. However, they remained at risk of readmission throughout the 30-day period.



**Figure 2. Most common principal discharge diagnoses associated with readmissions following carotid interventions**

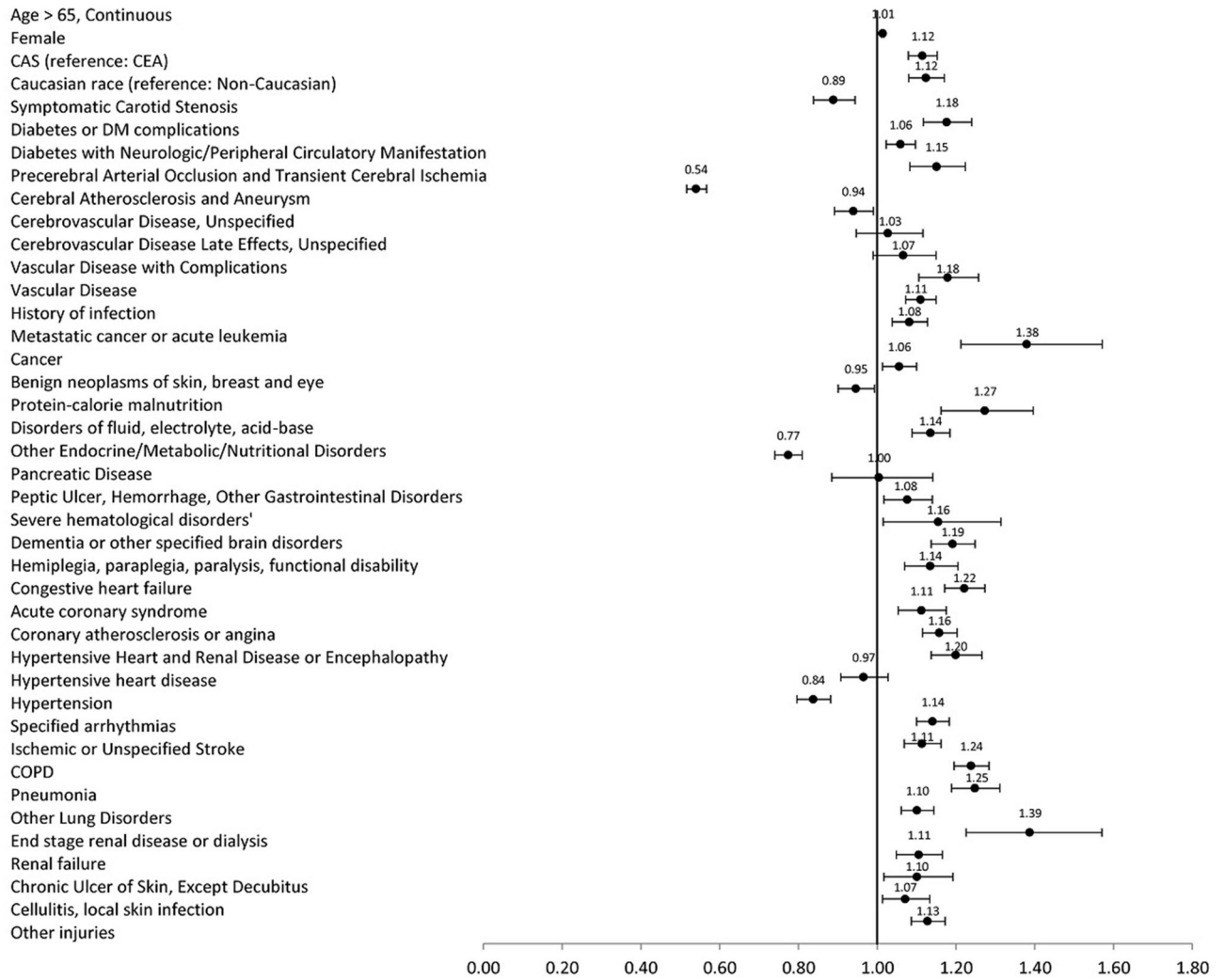
Patients were readmitted with a wide range of diagnoses with no single diagnosis contributing to more than 10% of readmissions. However, cerebral complications including ischemic stroke, TIA and cerebral hemorrhage were collectively responsible for 10.7% of readmissions.



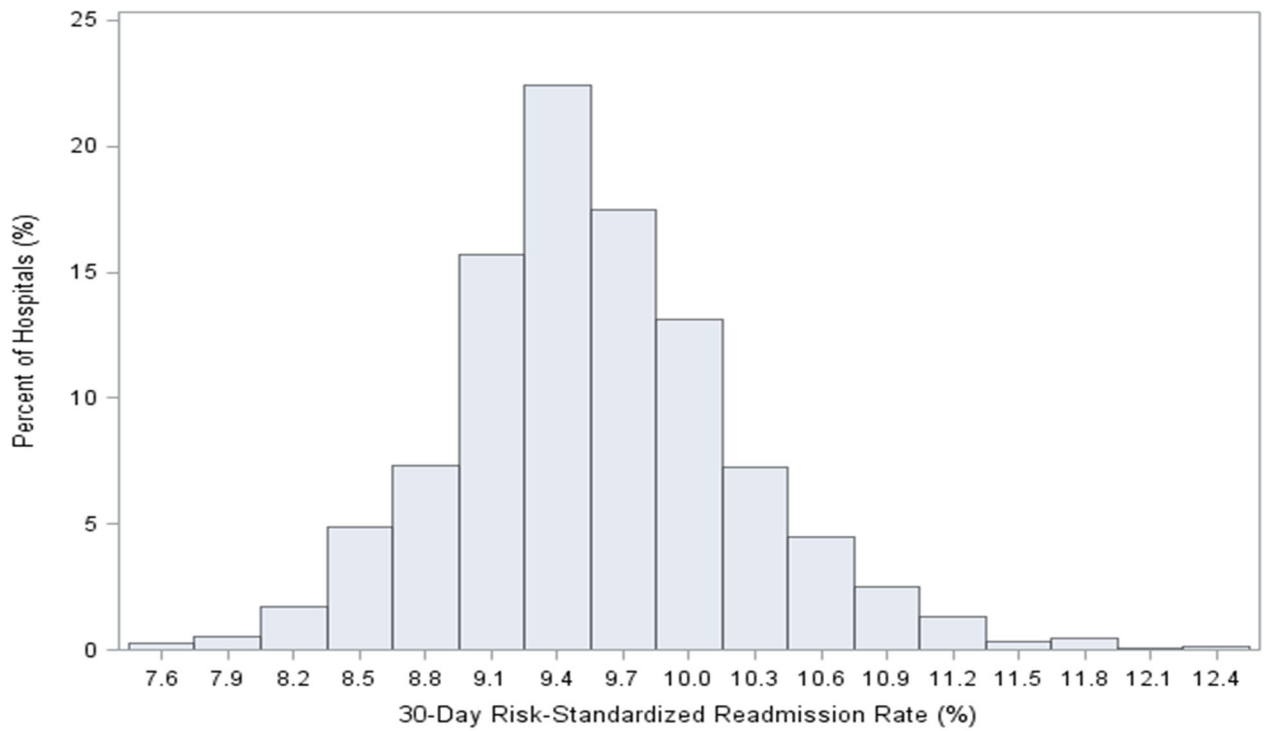
**Figure 3. The distribution of the most common diagnoses responsible for 30-day readmission over the time periods: 0–7 days, 8–15 days and 16–30 days**

Some readmission diagnoses varied over time. For instance, complications of care, heart failure and acute stroke were more often encountered during the first week following hospitalization. In contrast, other peripheral vascular diseases, chronic angina and coronary artery disease were more common in the third and fourth week following hospitalization.

Odds Ratio and 95% CI of GEE model



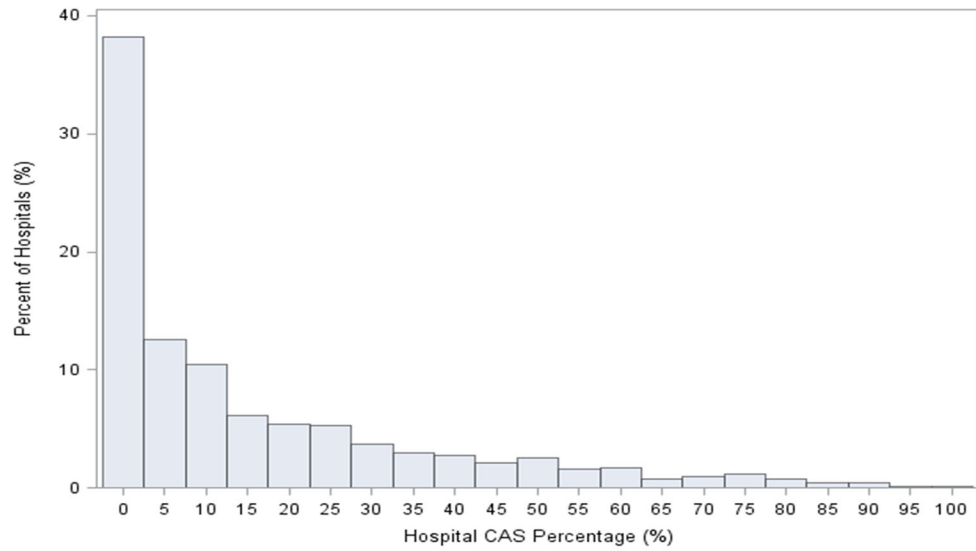
**Figure 4. Forest plot of odds ratios for risk factors associated with 30-day readmission**  
 A wide range of demographic characteristics and baseline comorbidities were associated with increased risk of readmission; most notably, age, female gender, Caucasian race, symptomatic carotid stenosis, diabetes, congestive heart failure, acute coronary syndrome and ischemic stroke.



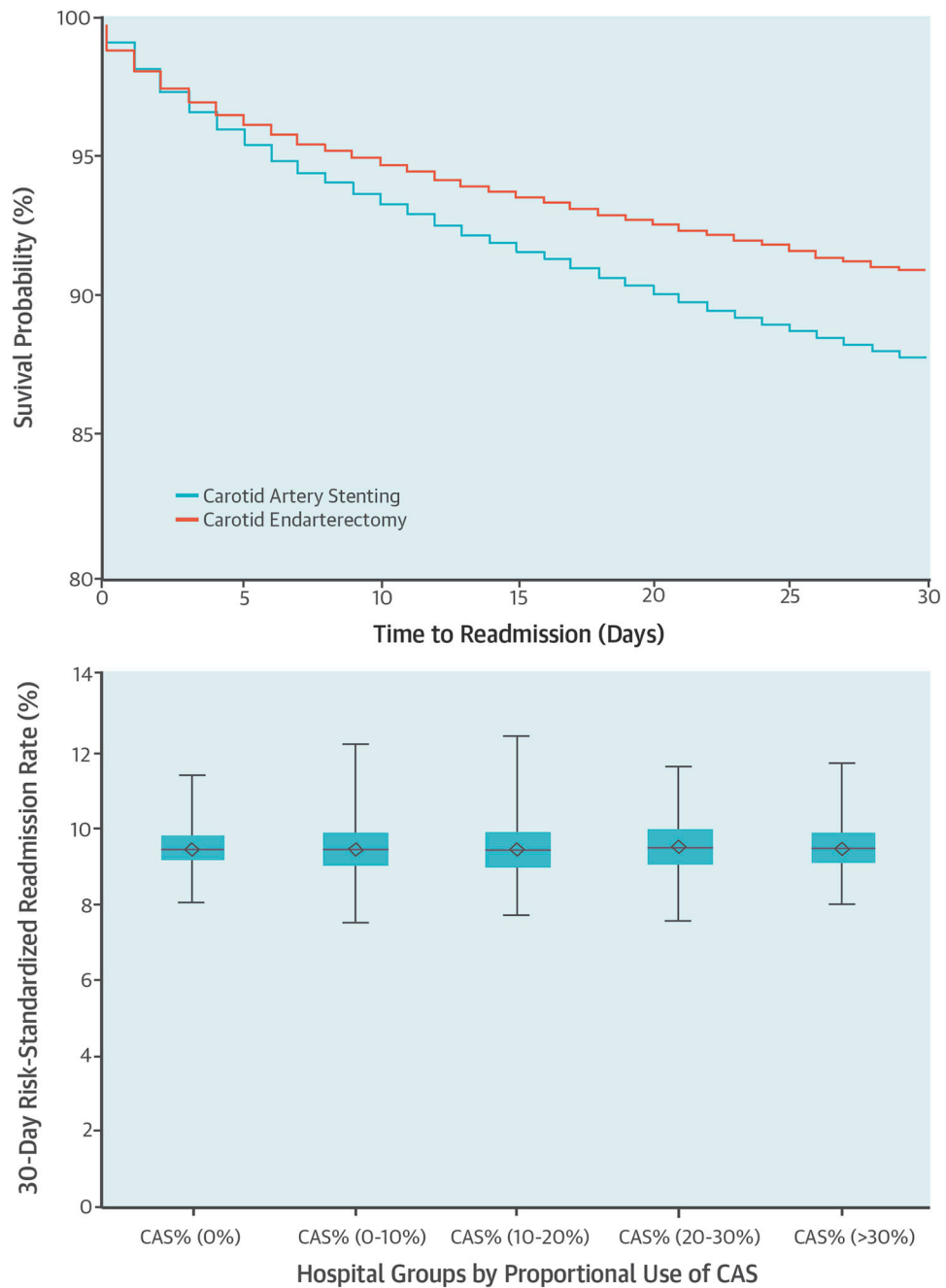
**Figure 5. Distribution of 30-day hospital-specific risk standardized readmission rates (RSRR) following carotid revascularization procedures**

There was modest hospital-level variation in 30-day RSRRs (Median: 9.5%, Interquartile range: 9.2% – 10.0%).





**Figure 6. Distribution of hospital proportional CAS use**  
38% of the hospitals did not perform a CAS procedure, and among hospitals that performed both CEA and CAS, the proportional use of CAS varied widely.



**CENTRAL ILLUSTRATION. Readmissions after carotid artery revascularization in the Medicare population**

Risk of readmission was significantly higher among patients undergoing CAS compared with patients undergoing CEA (Upper Panel: CAS - blue line, CEA – red line). However, risk standardized readmission rate (RSRR) of hospitals that used CAS more frequently were comparable to those of hospitals that performed CAS less frequently (Lower Panel).

**Table 1**

## Study sample baseline characteristics

Variable	Total Cohort (N=180,059 procedures)	CAS (N=33,228 procedures)	CEA (N=146,831 procedures)	P value*
Age, mean (standard deviation)	76.3 (6.4)	76.1 (6.6)	76.3 (6.3)	<0.001
Age > 80 years, %	29.4	29.1	29.5	0.139
Male, %	56.4	53.2	57.1	<0.001
White, %	93.2	90.2	93.9	<0.001
Comorbidities				
Symptomatic carotid stenosis, %	9.7	13.7	8.8	<0.001
Diabetes, %	43.3	40.9	43.9	<0.001
Diabetes with peripheral complications, %	6.9	6.8	6.9	0.322
Hypertension, %	89.3	85.7	90.1	<0.001
Hypertensive complications, %	14.0	15.2	13.7	<0.001
Congestive heart failure, %	19.7	23.9	18.7	<0.001
Coronary atherosclerosis, %	63.4	62.3	63.6	<0.001
Acute coronary syndrome, %	8.5	10.2	8.1	<0.001
Precerebral arterial occlusion, %	86.6	71.5	90.0	<0.001
Cerebral atherosclerosis, %	10.7	19.1	8.8	<0.001
Unspecified cerebrovascular disease, %	3.8	3.8	3.8	0.813
Vascular disease, %	43.1	45.2	42.6	<0.001
Vascular disease with complications, %	5.7	6.3	5.6	<0.001
Renal failure, %	17.6	19.0	17.3	<0.001
End stage renal disease, %	1.0	1.2	1.0	<0.001

\* t-test for continuous variables or chi-square test for categorical variables