

The Burden and Management of TIA and Stroke in Government-Funded Healthcare Programs

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Traditionally, *transient ischemic attack* (TIA) has been defined as a short-lived focal neurologic symptom or combination of symptoms of vascular cause in the carotid or vertebral-basilar artery territories lasting less than 24 hours.¹ Over time and with advances in neuroimaging techniques, which better define the pathophysiology of TIA, our definition of this disorder has evolved.² We now recognize that by adopting a tissue-based definition of TIA using magnetic resonance imaging (MRI) diffusion weighted imaging (DWI) sequences, approximately one third of TIA cases show ischemic brain injury, and the majority resolve within 60 minutes and most within 30 minutes. TIA is a medical emergency requiring rapid diagnosis and treatment, as the risk of stroke may be as high as 10% at 7 days after TIA and 15% at 30 days.³ Recognition of TIA and slight stroke symptoms is important as it is estimated that there are 9 million “silent” (subclinical) ischemic strokes, 2 million “silent” hemorrhagic strokes, and 1 of 10 persons living in the community harbor a “silent” stroke.⁴ TIA and stroke share the same cerebrovascular mechanisms, and both merit urgent diagnosis and treatment.⁵

In this article we review important aspects of TIA and stroke as they impact Medicare and Medicaid patient populations. First, we will focus on general knowledge in relation to TIA and stroke, such as the overall public health impact of these disorders, parallelism of TIA and stroke, and the importance of urgency of proper diagnosis and treatment. Then, we will highlight specific issues in relation to TIA and stroke in Medicare and Medicaid populations and provide examples of government-funded initiatives to improve TIA and stroke diagnosis and treatment.

TIA and Stroke: General Knowledge

Public Health Impact

TIA is a major public health problem with an estimated 240,000 such events occurring in the United States annually.⁶ Overall, TIA incidence increases with age and is generally more common in men and African Americans. About 15% of strokes are preceded by TIA, and about one half of those who experience a TIA, fail to report it to a healthcare professional.⁷ Furthermore, the prevalence of TIA is estimated to be 3.6% for men 75 to 79 years of age and 4.1% for women in the same age group. Within 1 year of TIA, up to 25% may die, and the 10-year combined stroke, myocardial infarction,

Abstract

Transient ischemic attack (TIA) and stroke are a common public health problem. Stroke is a leading cause of death in the United States, and TIA occurs frequently. In the United States it is estimated that there are 780,000 strokes and 240,000 TIAs annually. Many TIAs and strokes, however, may go unreported, and subclinical (“silent”) strokes and undiagnosed stroke and TIA symptoms in the community are common. This is of concern because TIA and stroke have evidence-based treatments to prevent subsequent or recurrent stroke, and access to rapid diagnostic and treatment facilities for these conditions has been shown to be highly effective to reduce the risk of stroke. Government-funded and managed care health initiatives play an important role in the prevention of stroke in TIA and stroke patients. Evidence-based guidelines should be incorporated into organizational treatment paradigms for these patients. We will discuss general concepts about TIA and stroke, emphasize specific issues in relation to TIA and stroke in Medicare and Medicaid populations, and provide examples of government-funded initiatives to improve TIA and stroke diagnosis and treatment.

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and vascular death risk is about 4% per year, or 42.8% overall.

Hospitalizations attributed to stroke are common among Medicare enrollees. In 2000, there were 445,452 such hospitalizations with an age-adjusted rate of 16.3/1000 enrollees.⁸ In the United States, there are an estimated 780,000 strokes each year, with 600,000 (77%) being “first” and 180,000 (23%) “recurrent” strokes, and a stroke occurs on average every 40 seconds.⁷ The risk of stroke increases exponentially with age. Furthermore, in the United States, African Americans have about twice the risk of stroke compared with whites, and men have an excess risk of stroke until approximately 75 years of age, when women have a higher risk. In fact, overall, because women live longer than men, more women die of stroke annually than men, and women account for 61% of US stroke deaths.⁷

Parallelism of Stroke and TIA

Parallelism between stroke and TIA is demonstrated on review of stroke outcomes data. For example, the risk of stroke soon after a stroke or TIA may be the same. In the Oxford Vascular Study, a population-based, prospective cohort, the risk of recurrent stroke at 7 days, 1 month, and 3 months was 8.0% versus 11.5%, 11.5% versus 15.0%, and 17.3% versus 18.5% in TIA versus minor stroke patients, respectively.⁹ Similar rates for stroke after TIA have been observed in a health maintenance organization (HMO) study carried out in northern California in the Kaiser Permanente system.¹⁰ Among 1707 patients with a mean age of 72 years, who were identified by emergency department physicians, 10.5% had a stroke within 90 days, and about 50% had their stroke within 2 days of onset of the TIA. Stroke occurrence in the study was predicted by 5 factors: age (>60 years) and history of diabetes mellitus, symptom duration greater than 10 minutes, and neurologic findings of weakness or speech impairment. These clinical features form the foundation of a screening tool that has been used to predict the extent of early risk of stroke after TIA. Unfortunately, knowledge of typical symptoms of TIA may be low among US primary care physicians and adults.^{11,12} Men, nonwhites, and persons with lower education and income may be less knowledgeable about TIA.

Stroke is a leading cause of death in the United States; for example, on average someone dies of stroke every 3 to 4 minutes, for an annual stroke mortality of more than 150,000 persons.⁷ Although hemorrhagic strokes are less common than ischemic strokes (the former constitute about 10%-15% of all strokes), mortality rates for hemorrhagic stroke are generally much higher than those for ischemic stroke. Among Medicare Part B eligible persons living in the community, who were 65 years of age or older, 30-day case fatality rates were 12.6% for all strokes, 8.1% for ischemic strokes, and 44.6% for hemorrhagic strokes.⁷

The parallelism between stroke and TIA is again observed when long-term mortality rates were determined for Part A Medicare claims and Social Security Administration mortality data for stroke and TIA patients from Connecticut acute care hospitals.¹³ The mortality rates 1 year after discharge and 5 years cumulatively were 26.4% and 60.0% for acute ischemic stroke and 14.8% and 49.6% for TIA, respectively. Furthermore, among 2447 cohort subjects with minor stroke or TIA from the Dutch TIA Trial, after a mean follow-up of 10.1 years, the 10-year risk of death for those with stroke was 46.6% versus 34.1% for those with TIA.¹⁴ Therefore, these studies show parallel mortality rates among stroke and TIA patients.^{13,14}

Urgency of Diagnosis and Treatment

Rapid diagnosis and treatment of TIA or minor stroke patients have been shown to substantially reduce the risk of subsequent stroke.^{15,16} Development of and urgent access to specialized clinics for TIA and minor stroke patients may reduce the risk of subsequent stroke by 80%. This emphasizes the importance of proper identification and management of these patients who are often older and Medicare eligible. Emphasis on educating our elderly and other high-risk persons to recognize the warning signs of TIA and stroke and availability of rapid diagnosis and treatment facilities could reduce the risk of subsequent stroke and its complications in these patients.⁵

Undiagnosed or unrecognized TIA or stroke events, however, may be common in the general population, and these persons may not receive stroke prevention therapy. In the REGARDS (Reasons for Geographic and Racial Differences in

Stroke) study, there was a high prevalence of stroke symptoms among persons in the general population without a diagnosis of stroke or TIA.¹⁷ The prevalence of 1 or more stroke symptoms was 17.8%, and was more common in African Americans and those with a lower education level, lower income, fair to poor perceived health status, and higher Framingham stroke risk scores. The findings from the REGARDS study provide evidence for symptoms that may be associated with cerebrovascular complications, and challenge us to further identify and treat such persons at risk of stroke, especially among underserved communities and the poor.

Burden of TIA and Stroke Specific to Medicaid and Medicare Patient Populations

Access to medical care may be an important predictor of health outcomes.¹⁸ Furthermore, access to medical care is often associated with indicators of socioeconomic status. The provision of access to medical care does not guarantee, however, utilization of preventive and treatment services and better health outcomes as the hierarchy of life's needs may prevent meaningful access to medical care. In the following text, we scrutinize TIA and stroke outcomes based on differences of medical insurance type. The situation becomes increasingly challenging as the number of uninsured and underinsured continues to increase in the United States. The current estimate of direct and indirect costs for stroke care of \$65.5 billion in the United States in 2008⁷ could continue to rise under these circumstances.

Medicaid and Uninsured Patient Studies

Shen and Washington examined the relationship between insurance status and disparities in hospital care for stroke patients.¹⁹ Using *International Classification of Diseases, Ninth Revision* codes for intracerebral hemorrhage and acute ischemic stroke, the 2002 National Inpatient Sample database was searched and information was abstracted about neurologic impairment status and mortality. Patients with TIA were excluded in this study. A final sample included 9137 adult discharges with intracerebral hemorrhage, 63,500 with occlusion of cerebral arteries or ill-defined stroke representing acute stroke, and 18,050 discharges with carotid artery occlusion. Insurance status was categorized as Medicaid, uninsured, privately insured

by HMO/prepaid health plans, Medicare, and other insurance categories (eg, workers' compensation, CHAMPUS, CHAMPVA, Title V, and other governmental programs). Findings for Medicaid, uninsured, and privately insured patients were reported in the analysis. Paralysis and coma were considered increasingly severe levels of neurologic impairment. Hospital characteristics including stroke volume and hospital bed size were controlled for.

Among patients with intracerebral hemorrhage, percentages of those with coma were 8.1%, 8.4%, and 7.3% for Medicaid, uninsured, and privately insured patients, respectively.¹⁹ Unadjusted mortality was highest among uninsured patients (34.7%) followed by Medicaid patients (28.0%) and privately insured patients (28.2%). For acute ischemic stroke, mortality was 6.0%, 5.3%, and 4.4% for uninsured persons, and those with Medicaid and private insurance, respectively. Overall, the data showed that although uninsured patients were the youngest of the 3 groups, they had the highest mortality risk of both types of stroke. In addition, uninsured patients with acute ischemic stroke had the highest risk for the most severe neurologic impairment and coma, as well as the longest hospital stay. In summary, the findings suggest that uninsured patients when compared with those who are insured do worse on a number of important stroke indicators, including level of neurologic impairment, mortality risk, and length of hospital stay.

The role of policies affecting healthcare eligibility has been studied in relation to stroke. Specifically, Wisdom et al determined that policies affecting Medicaid eligibility and efforts to expand Medicaid were associated with stroke mortality rates in women.²⁰ This study emphasizes the overall importance of eligibility for healthcare insurance, citing eligibility for Medicaid benefits as an example.

Medicare Patient Studies

In a study of 17,437 Medicare inpatient hospital records of TIA patients 65 years of age and older representing a 20% random national sample in 1991, the role of neurologists was assessed to explain black-white differences in the use of diagnostic studies for stroke.²¹ Included were 5 outcome measures: noninvasive cerebral vascular tests, cerebral angiography, carotid endarterectomy, anticoagulant treatment as proxied by outpatient pro-

thrombin time, and attending physician specialty (neurologist vs other specialist). After statistical adjustment, African Americans were significantly less likely to have noninvasive cerebrovascular testing, cerebral angiography, and carotid endarterectomy compared with whites, and to be treated by a neurologist. Under the care of a neurologist, patients were more likely to undergo testing but less likely to have carotid endarterectomy. Overall, the study findings suggested that African American patients with TIA might have less access to stroke services and at least, in part, this may be explained by less access to neurologists.

In another study to compare utilization and outcomes after stroke in Medicare HMO and fee-for-service (FFS) beneficiaries, administrative data from 11 Medicare and a large national health plan of those 65 years and older discharged with ischemic stroke during 1998-2000 were studied.²² There were 4816 HMO patients and a random sample of 4187 FFS patients from 422 hospitals. Key outcome measures were survival, rehospitalization, length of stay, discharge destination, and warfarin use. Overall, HMO patients were younger, male, nonwhite, and had fewer comorbid conditions. After statistical adjustment, HMO patients were 34% more likely to be rehospitalized for acute stroke or rehabilitation services when compared with FFS patients, and, in addition, HMO patients were less likely to be rehospitalized for fluid and electrolyte disorders as well as other circulatory or respiratory disorders.

In another study to identify predictors of complicated transitions (ie, persons who go from less to more intense care settings after hospital discharge or “bounce backs”) within 30 days after hospital discharge for acute ischemic stroke among Medicare beneficiaries 65 years of age and older, movement from less to more intense care settings after hospital discharge was reviewed.²³ Among 39,384 patients during 1998-2000, 20% experienced at least 1 complex transition, and 16% experienced more than 1 complicated transition. Predictors of complicated transition included older age, African American race, Medicaid enrollment, prior hospitalization, presence of gastrostomy tube or chronic disease, length of stay, and discharge site (skilled nursing facility/long-term care facility).

In the nationally representative Health and Retirement Study, longitudinal data were assessed to determine self-reported healthcare use and expenditures from 1992 to 2004 among 5158 adults who were privately insured versus those uninsured before Medicare coverage eligibility at 65 years of age.²⁴ For those who had been previously uninsured and had a diagnosis of hypertension, diabetes, heart disease, or stroke prior to 65 years of age, there were subsequently significantly more doctor visits, hospitalizations, and healthcare expenditures. These findings are consistent with those from a National Health Interview Survey study, which showed that stroke survivors younger than 65 years of age reported less access to physician care and medication affordability than older stroke survivors who could be enrolled in Medicare.²⁵ By expanding healthcare insurance to those in younger age groups (eg, 50-64 years) closer to traditional Medicare beneficiary eligibility, it may be possible to partially offset higher current and future healthcare costs of those uninsured prior to receiving Medicare benefits.²⁴

■ **Table 1. Transient Ischemic Attack and Stroke Symptoms⁵**

Carotid Arterial System Symptoms
1. Motor dysfunction (1 or both limbs on the same side)
2. Sensory alteration (1 or both limbs on the same side)
3. Loss of vision in 1 eye or part of 1 eye
4. Homonymous hemianopsia
5. Combination of any of the above symptoms
Vertebral-Basilar Arterial System Symptoms
1. Symptoms 1-5 above (carotid arterial system) plus equilibratory gait or postural abnormality (eg, ataxia, imbalance, or unsteadiness)
2. Motor dysfunction and sensory alteration may be bilateral
3. Visual loss may be complete or partial loss of vision in both homonymous fields
4. Symptoms may be unilateral

Adapted from Gorelick PB. *J Med.* 2009;2(1):3-10.

Government-Funded Initiatives to Improve TIA and Stroke Management, Current and Future Stroke Management

Lack of reimbursement or adequate reimbursement to care for acute TIA and stroke patients may be an impediment to successful diagnosis and treatment of those with cerebrovascular disease.²⁶ There are examples of successful regional quality improvement initiatives, however, for the Centers for Medicare & Medicaid Services (CMS) popu-

Table 2. ABCD2 Features and Point Values and 2-, 7-, and 90-Day Stroke Risk After TIA According to ABCD2 Risk Category⁵

A. ABCD2 Features and Point Values			
Feature	Point Value^a		
Age ≥60 years	1		
Diabetes mellitus	1		
SBP >140 or DBP 90 mm Hg	1		
Duration (10-59, ≥60 min)	1-2 ^b		
Speech impairment without focal weakness	1		
Focal weakness	2		
Risk groups by ABCD score: Low risk (0-3), moderate risk (4-5), and high risk (6-7)			
B. 2-, 7-, and 90-Day Stroke Risk After TIA According to ABCD2 Risk Category			
Risk Group	Stroke at 2 Days, %	Stroke at 7 Days, %	Stroke at 90 Days, %
Low (0-3 points)	1.0	1.2	3.1
Moderate (4-5 points)	4.1	5.9	9.8
High (6-7 points)	8.1	12.0	18.0

DBP indicates diastolic blood pressure; SBP, systolic blood pressure; TIA, transient ischemic attack.
^aRange: 0-7.
^b10-59 min (1 point), ≥60 min (2 points).
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 Table 2B reprinted with permission from Johnston SC, et al. *ACP Journal Club.* 2007;146(3):79. © Annals of Internal Medicine.

lation. For example, The Joint Commission and state certification programs for primary stroke centers and the Paul Coverdell National Acute Stroke Registry Prototypes for quality of stroke care have led to improvements in administration of anti-thrombotic therapy and other key stroke treatment benchmarks.²⁷⁻³⁰ Organization of stroke care has been a positive stimulus to advance quality stroke care and reduce stroke-related morbidity and mortality.³¹ Not all such initiatives, however, have led to positive outcomes. In 1 study of Medicare beneficiaries in Maryland, Nevada, New York, Utah, and Washington, use of quality improvement organizations did not significantly improve antithrombotic prescriptions at discharge for patients with acute stroke or TIA in participating versus nonparticipating hospitals.³²

Pay-for-performance initiatives, such as the Physician Quality Reporting Initiative under CMS, are being piloted as quality improvement programs that include reimbursement for successfully meeting select stroke diagnostic and treatment benchmarks.³³ Such programs could prove very useful to enhance appropriate stroke treatments for many segments of the population.³⁴

Symptoms of TIA and stroke that should be familiar to primary care physicians are listed in **Table 1.**⁵ In addition, features of the ABCD2 score, a screening tool to determine early risk of stroke after TIA and absolute stroke risk according to the ABCD2 score by time after TIA, are listed in **Tables 2A** and **2B.**⁵ Finally, evidence-based guidelines for risk factor management and use of antithrombotics and other therapies for TIA and stroke are listed in **Tables 3A** and **3B.**⁵

Conclusions

Medicare and Medicaid patients experience a high public health burden of TIA and stroke. Age and traditional cardiovascular risk factors, such as hypertension, diabetes mellitus, hypercholesterolemia, heart disease, and other factors, are common in these populations and place such persons at high risk for TIA and stroke.⁵ TIA and stroke are a medical emergency and should be diagnosed and treated expeditiously. Recent studies have shown that specialty clinics that provide rapid diagnosis and treatment of these conditions can dramatically reduce the risk of subsequent stroke soon after TIA.^{15,16} Evidence-based guidelines are

Table 3. Vascular Risk Factor Management and Antithrombotic and Other Therapeutic Recommendations for Patients With TIA⁵

A. Vascular Risk Factor Management Recommendations for TIA and Recurrent Stroke Prevention⁵	
Vascular Risk Factor	Recommendation
Hypertension	Include lifestyle modification to control BP; treatment effects extend to hypertensives and nonhypertensives; optimal drug regimen remains uncertain but the use of a diuretic and ACEI is supported and BP management must be individualized based on individual patient characteristics; and benefit has been associated with an average reduction of BP of about 10/5 mm Hg
Diabetes mellitus	Rigorous control of BP (include ACEIs and ARBs) and lipids; aim for HbA1C ≤7%
Cholesterol	Follow NCEP ATP III lifestyle, dietary and medication recommendations plus administer a statin drug with intense lipid-lowering effects to those with LDL cholesterol in the range of 100-190 mg/dL; low HDL cholesterol may be treated with niacin or gemfibrozil
Smoking	Recommend smoking cessation; avoid environmental smoke; manage with counseling, nicotine replacement therapy, and oral smoking cessation medications (eg, bupropion, varenicline)
Alcohol	Reduce or eliminate heavy alcohol use; for those who drink, ≤2 drinks/d for men and 1 for nonpregnant women may be considered
Obesity	For overweight or obese persons, aim for a BMI of 18.5-24.9 kg/m ² and weight management through balance of caloric intake, physical activity, and behavioral counseling
Physical inactivity	For those capable of exercise, at least 30 min of moderate intensity physical exercise most days of the week; a supervised program is recommended for those with disability after ischemic stroke
B. Antithrombotic and Other Therapeutic Recommendations for TIA and Recurrent Stroke Prevention⁵	
Intervention	Recommendation
Antiplatelet therapy	Aspirin 50-325 mg/d, aspirin plus extended-release dipyridamole 25 mg/200 mg bid, or clopidogrel 75 mg/d are all acceptable initial options
Warfarin	For atrial fibrillation, aim for an international normalized ratio range of 2.0-3.0 with a target of 2.5; if warfarin is contraindicated, use aspirin 325 mg/d
Carotid endarterectomy (CEA)	If TIA or ischemic stroke in the last 6 months, recommend CEA if 70%-99% extracranial carotid stenosis and the surgeon has a perioperative morbidity and mortality rate <6%; CEA is recommended for those with 50%-69% stenosis depending on age, sex, comorbidities and severity of symptoms (eg, those with hemispherical compared to retinal symptoms and men may attain greater benefit); medical management is recommended for routine ischemic stroke or TIA symptoms if extracranial carotid stenosis is <50%
Carotid artery stenting (CAS)	With >70% symptomatic stenosis and not a candidate for CEA, CAS may be recommended if performed by operators with periprocedural morbidity and mortality rates of 4%-6%
Intracranial stenting	The usefulness of intracranial angioplasty/stenting remains uncertain and is considered investigational
Patent foramen ovale (PFO)	Insufficient data exist to make recommendations about use of PFO closure devices. PFO closure devices may be considered for patients with recurrent cryptogenic stroke despite medical therapy; for patients with ischemic stroke, antiplatelet therapy is reasonable; warfarin is reasonable if there are indications for oral anticoagulants (eg, venous thrombosis or hypercoagulable state)
Hyperhomocysteinemia	No evidence that reduction of homocysteine will lead to reduction of stroke risk; if homocysteine levels >10 μmol/L, it is reasonable to recommend daily standard multivitamins

ACEI indicates angiotensin-converting enzyme inhibitor; ARBs, angiotensin receptor blockers; BMI, body mass index; BP, blood pressure; HbA1C, glycosylated hemoglobin; HDL, high-density lipoprotein; LDL, low-density lipoprotein; NCEP ATP III, National Cholesterol Education Program Adult Treatment Panel III; TIA, transient ischemic attack.
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available to direct diagnosis and treatment of TIA and stroke patients, and should be integrated by healthcare organizations into quality improvement paradigms for these conditions.³⁵⁻³⁸ CMS and regional quality improvement programs are available to stimulate better care of TIA and stroke patients. One such program, the American Heart Association Get With the Guidelines—Stroke program, was shown recently to be associated with dramatic improvements in adherence to prespecified performance measures for stroke and TIA.³⁹ Symptoms of TIA, the ABCD2 score screening tool for TIA, and treatment guidelines for TIA and stroke patients are listed in Tables 1 through 3.

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