Episode-based payment for ischemic stroke care with implications for neurologists

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Summary

Episode-based payment bundles a single lumped payment around a health care event, such as ischemic stroke. Hospitals are already experienced with a type of episode-based payment for stroke, the diagnosis-related group payment system. Ischemic stroke fits well into an episode-based system because (1) ischemic stroke is common, (2) an ischemic stroke care episode lasts for a definable period of time, and (3) ischemic stroke care costs are high and episode-based payment could provide savings. In an episode-based ischemic stroke care payment system built around cost savings, it is unclear whether neurologists would provide savings. Neurologists need to prove, and define, the value they bring to ischemic stroke care.

Episode-based payment will change the way that health care is provided by bundling a single payment around a defined health care event, or episode, such as knee replacement or an acute stroke. A care episode may be a brief event or a period of up to a year, during which time a patient may see multiple providers for episode-related problems. Provider service fees are paid from the bundled payment in an episode-based model. Episode-based payment is a pilot project of the Patient Protection and Affordable Care Act.

We already live with a degree of episode-based payment, such as with Medicare-related diagnosis-related groups (DRGs). However, episode-based payment can be much more complex than DRG payments for hospitalization. The DRG system pays for acute hospitalization as a bundle. For acute ischemic stroke, the DRG payment amount depends on several factors, including severity of illness, comorbidities, and avoidable complications. The DRG system does not provide professional payments to physicians.

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There is concern that since the DRG payment system does not bundle acute and posthospitalization care, acute care hospitals may discharge patients to postacute care inappropriately early to maximize margins.¹ Episode-based payment would pay for acute and postacute care together, possibly increasing the likelihood of appropriate timing of care transitions. Since postacute care needs are common in ischemic stroke, it makes sense to investigate episode-based payment as a cost-savings measure.

Epidemiology

In the United States, there are approximately 800,000 new or recurrent strokes each year. About 85% of strokes are ischemic. There are more than 5,500,000 stroke survivors in the United States today with a range of disabilities.

Ischemic stroke is an end-stage vascular disease, often preceded by years of uncontrolled risk factors like hypertension, high cholesterol, and smoking. After stroke hospitalization, strict risk factor control can reduce the risk of secondary events. This may require frequent outpatient visits. However, classic vascular risk factors are sometimes absent in strokes of young and middle-aged individuals, as well as in patients with stroke from atrial fibrillation.

Most ischemic stroke survivors have resultant neurologic deficits and make frequent use of rehabilitation, especially in the year immediately following stroke. Stroke survivors typically experience significant functional recovery over several weeks with or without inpatient rehabilitation, followed by slower gains over more months.

Stroke survivors are at high risk of rehospitalization, with rates estimated at 12% over 30 days poststroke (University Healthsystems Consortium data, accessed April 2013). Close outpatient follow-up and transitions of care management may reduce readmission risk.

Episode-based payment makes sense for ischemic stroke

Ischemic stroke is common enough to collect normative data to determine appropriate costs. In addition, episodes of ischemic stroke care are expensive, and costs are expected to rise. The high incidence and expense of stroke mean that cost savings would be meaningful on a large scale. Ischemic stroke care episodes are also easily definable and can be divided into acute care, postacute care, and ambulatory care.

Costs of acute care include ambulance transport and acute hospitalization. Hospital costs vary depending on a number of factors. Postacute care includes inpatient rehabilitation or home health/outpatient therapy, the latter costing less. Ambulatory care includes visits related to stroke risk factor control and might include rehabilitative care for up to a year.

Milestones of stroke recovery typically occur over 1 year or less. Sometimes stroke-related care becomes chronic, such as with poststroke persistent spasticity.

Ischemic stroke outcomes are quantifiable. Both the NIH Stroke Scale (NIHSS) and the modified Rankin Scale (mRS) can measure outcomes in ischemic stroke patients and are easy to test and record. Measuring NIHSS and mRS in patients is a requirement of Joint Commission–Certified Comprehensive Stroke Centers.

Quality and efficiency measures that are already reported for ischemic stroke could be applied to measurement of care quality for episode-based payments. Such measures are used by organizations such as the Joint Commission, the American Heart Association, and (now) the Centers for Medicare & Medicaid Services (CMS). Unfortunately, these are not outcome

Table Cost for an ischemic stroke using the service/item

	Cost per stroke, \$	% Cost
Ambulance ^a	164	0
Hospital/emergency department ^a	12,423	28
Inpatient rehabilitation ^a	25,968	59
Neurologist ^b	783	2
Therapies, assistive devices, home health ^a	3,218	7
First year of outpatient expenses ^{a,b}	1,260	3
Total	43,816	100

^a Costs derived from reference 3.
^b Cost estimate based on personal data.

measures. Outcome measures such as impairment scales should be included in an episode-based model.

Description of an ischemic stroke episode

An example of a single ischemic stroke episode is provided, recognizing that it falls on the wide spectrum of presentations, access to care, provision of care, and outcomes. This is intended as a framework for discussion.

Sudden stroke symptoms are followed by activation of emergency medical services and rapid transport to a stroke hospital. In the emergency department, laboratory and radiologic tests quickly occur in tandem with a focused neuromedical evaluation. IV thrombolysis is administered, which is likely to improve the outcome of the stroke. The patient is admitted under a neurologist's care with dedicated nursing, cardiac monitoring, and medications to control high blood pressure and hyperglycemia. Diagnostic testing includes CT scanning, MRI, and echocardiography. New-onset atrial fibrillation is determined to be the stroke's cause. The patient is determined to be an acute rehabilitation candidate. At discharge, the patient is on an anticoagulant and a cholesterol-reducing agent, and adjustments have been made to medications for preexisting hypertension and diabetes. Consultations included cardiology and endocrinology. The hospital stay was 4 days.

At the rehabilitation facility, goals are set and therapy begins. The patient is discharged home, functionally independent, after 1 week.

The patient visits the neurologist for follow-up 2 weeks later. There have been no additional stroke symptoms, medications are tolerated, and risk factors are controlled. The neurologist performs an outcome assessment, counsels on lifestyle modification to reduce stroke risk, and releases the patient to primary care.

Episode costs

Cost estimates for ischemic stroke episodes vary widely. A cost comparison from 53 reports estimated the range for an episode of ischemic stroke to be \$7,309 to \$146,149 (mean \$28,253) in the United States.² Another study estimated costs of stroke in the United States in 2005 dollars through the year 2050.³ In the table, those estimates are used to build out costs for a representative episode of ischemic stroke care. The study estimated costs for a neurologist to be \$83, which is too low if a neurologist is heavily involved in hospital care. An estimate of the author's personal claims data was substituted for neurologist costs and also incorporated into outpatient costs for the first year. Substituting the author's personal claims data is admittedly tenuous but illustrates the point that sources for neurology costs in stroke are lacking.

Figure 1 Distribution of acute hospital costs by department in thrombolysed acute stroke cases

Modified from Demaerschalk BM, Durocher DL. *Stroke* 2007;38:1309-1312. ED = emergency department.

The author's estimate for a representative ischemic stroke episode is \$43,816. The greatest costs are for inpatient rehabilitation (59%; \$25,968), representing the greatest cost-savings opportunity. Neurology costs are relatively low. Even with a significant upward adjustment to reflect the author's experience as a stroke neurologist, the cost for a neurologist for 1 year in an ischemic stroke episode is only 2% of total costs.

Evidence is limited that inpatient rehabilitation, which is expensive, is consistently superior to outpatient or home health rehabilitation for stroke outcomes. A systematic review of randomized trials suggested a benefit for inpatient multidisciplinary rehabilitation in stroke patients.⁴ Because of the high costs of inpatient rehabilitation, selection of rehabilitation in an episode-based care system may favor home health or outpatient therapy where practical. There is risk, however, that patients would not receive the rehabilitation that they need to return to maximum function and may not reintegrate into the community. Costs for stroke care could go up. Definitive research into stroke outcomes with different rehabilitation modalities would be helpful to set policy in this area.

Current hospital-based costs for stroke care may outstrip reimbursement. Two journal articles examined the cost of stroke-related hospitalization when thrombolytics were administered (figure 1) and found varying results.^{5,6} Neither article examines the overall cost of a stroke care episode taking into consideration physician fees and postacute care costs. On August 12, 2005, CMS included the new DRG 559. DRG 559 allowed a hospital to be reimbursed an average of \$11,578 for the care of an acute ischemic stroke patient treated with thrombolysis. Previously, DRG codes for stroke (DRG 14 and DRG 15) limited hospital reimbursement to \$4,000 to \$6,000 regardless of the type of acute therapy.⁵

Tier payment based on severity of illness and quality

With the existing DRG system as an example, an episode-based payment system for stroke should be tiered based on factors like severity of illness, comorbidities, and hospital-acquired conditions. Good ischemic stroke care includes administration of thrombolytics where appropriate, and although thrombolytic administration is likely to improve 3-month outcomes, thrombolysis may increase costs for acute hospitalization. It therefore makes sense to also include a special payment provision to acute care hospital cases for appropriate thrombolytic administration.

Bonuses for high-quality, efficient care based on outcomes and costs should be considered, while enforcing penalties for poor aggregate outcomes, potentially avoidable complications, or excessive readmissions. Bonus payments and penalties need to be adjusted for stroke severity, comorbidities, and other factors.

Figure 2 Distribution of charges for stroke cases (n = 23,144), all Kentucky hospitals CY 2012 and Q1 CY13

Range: \$97.16—\$1,220,061. Median: \$19,414. Mean: \$30,588. Data from Kentucky Hospital Association.

A value-based stroke care network fits in the model

Norton Healthcare (a Louisville, KY not-for-profit system of 4 large hospitals) and UK Health-Care (the health care enterprise of the University of Kentucky) partnered to develop a stroke care network. The network uses value-based care as a framework with goals of improving access to, and quality of, stroke care while keeping costs efficient.

The network currently includes 23 acute care hospitals in Kentucky and West Virginia with more than 5,000 yearly acute stroke discharges, and there are plans to branch into dedicated postacute care hospitals. With postacute care hospitals, the network could serve as a vehicle for accepting and allocating bundled payments for ischemic stroke care within the network. Value-based networks could serve as meaningful models for accepting and distributing payments for ischemic stroke care in this era of reform.

A value-based network could negotiate and accept a large population-based bundled payment for multiple episodes of ischemic stroke, monitor quality of care, and pay bonuses to (or penalize) members based on care quality. With careful management and past success with episode-based payment in other arenas as a guide, it is reasonable to expect that hospitals and providers could do well financially with such an arrangement. Use of inpatient rehabilitation services might decline in this model. The value-based network model for stroke care may not be feasible for all areas of the country, and even within a value-based network the value of neurologists is unproven.

As a starting point, we have charge data for stroke cases from all Kentucky hospitals (figures 2 and 3). Mean charge per stroke case for acute hospitalization is \$30,588. Charge data do not substitute for cost data, but charges are a consistent way to compare.

Effect on neurologists

In the author's opinion, neurology advocacy and lobbying groups are not looking ahead enough to the future with capitation. We need to develop a new value proposition for payers as we move forward to capitation and bundled, episode-based payments.

Currently, non-neurologists, including internal medicine hospitalists, may decline to care for stroke patients based on "comfort" with the diagnosis and uncertainty of care pathways.

Figure 3 Density plot of length of stay vs charge data for stroke cases (n = 23,144), all Kentucky hospitals CY 2012 and Q1 CY13

Therefore stroke patients, regardless of severity, may be passed to centers where neurologists are at the ready. This is believed to be a best practice, because skilled neurologists are thought to be the best at managing stroke care. However, although stroke unit quality care pathways are shown to decrease morbidity and mortality from stroke,⁷ it remains unproven whether neurologists themselves make a substantial difference in stroke outcomes. It is possible that neurologists may actually increase stroke care costs. A 2003 VA study suggested that neurologists order more tests than non-neurologists for acute stroke patients but that likelihood of death or disability (at discharge) is lessened.⁸ However, that study may no longer be relevant considering the advent of primary stroke centers and wide adoption of stroke care pathways that are followed with or without a neurologist.

To build neurologists into the episode-based payment model, we should demonstrate that neurologist involvement in stroke care is meaningful in a value-based model. A neurologist probably adds value through increased access to stroke care. That may be enough to move forward with including neurologist payment as part of an episode, but it is unsustainable because neurology care may be seen as a cost that is unproven to add quality. A single French study found that evaluation by a neurologist in the emergency setting improved neurologic diagnoses (which may add to quality of care), but this was not stroke-specific and did not examine costs.⁹

Neurologists need to demonstrate that their involvement in stroke care improves quality and cost control in order to be stroke care leaders in an episode-based payment environment. Otherwise neurologists may be written off as an excess cost. Hospitals could decide to use less expensive general hospitalists instead.

Neurologists could negotiate better payment than the estimated \$700 per episode of stroke care. The neurologist can bring an understanding of pathways to acute care discharge and functional rehabilitation that will be important to control costs in an episode-based payment environment. Expert neurologists could lead teams to reduce costs of care while increasing quality and could negotiate increased personal compensation under a shared savings model.

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DISCUSSION

Lost productivity and wages in stroke victims are the true high financial costs of stroke, and as a society we need to succeed in preventing first strokes. In the future, the author hopes that ischemic stroke will be viewed as an avoidable complication and that health networks will receive incentives for fewer ischemic strokes than expected in their care populations. Until then, we need to focus on value in stroke care with improved quality, access, and cost control.

Episode-based payments for ischemic stroke taking into account severity of illness with an element of payments that reward quality of care might save money while improving stroke outcomes. High volume stroke care networks might be best poised to absorb risk and monitor quality in an episode-based payment environment. With episode-based payment, inpatient stroke rehabilitation utilization might decline.

Whether a hospital should absorb outlier costs in an episodic payment structure has not been sufficiently addressed. The risk could be spread out within a large group such as a value-based stroke care network. Alternatively, there could be a special payment provision for outliers in episode-based care such as with the CMS Hospital Inpatient prospective payment system.

While viewed as stroke gurus, neurologists are often not involved in the care of ischemic strokes, and proof is limited that neurologists improve stroke outcomes. A 1996 study suggested that neurologists improve acute stroke outcomes while increasing costs of care.¹⁰ This should be reexamined in the era of accredited stroke centers. Stroke costs in the United States are expected to rise substantially in the future.¹¹ Meanwhile, neurologists are behind in health care reform and need to catch up quickly to ensure relevance in stroke care.

Neurologists should reposition for success in an episode-based payment environment. This means recognizing that points of negotiation for physician payment may change based on reforms, gaining a deeper understanding of the cost structure in the continuum of stroke care and how a neurologist fits, and being prepared to objectively define the value that a neurologist brings to the table in stroke care.

REFERENCES

1. Neu CR, Palmer A, Henry DP, Olson GT, Harrison S. Extending the Medicare Prospective Payment System to Posthospital Care. Planning a Demonstration, Santa Monica, CA: RAND Corporation; 1986.
2. Luengo-Fernandez R, Gray AM, Rothwell PM. Costs of stroke using patient-level data: a critical review of the literature. *Stroke* 2009;40:e18–e23.
3. Brown DL, Boden-Albala B, Langa KM, et al. Projected costs of ischemic stroke in the United States. *Neurology* 2006;67:1390–1395.
4. Langhorne P, Duncan P. Does the organization of postacute stroke care really matter? *Stroke* 2001;32:268–274.
5. Demaerschalk BM, Durocher DL. How diagnosis-related group 559 will change the US medicare cost reimbursement Ratio for stroke centers. *Stroke* 2007;38:1309–1312.
6. Brinjikji W, Rabinstein AA, Cloft HJ. Hospitalization costs for acute ischemic stroke patients treated with intravenous thrombolysis in the United States are substantially higher than medicare payments. *Stroke* 2012;43:1131–1133.
7. Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database Syst Rev* 2002;CD000197.

8. Goldstein LB, Matchar DB, Hoff-Lindquist J, Samsa GP, Horner RD. VA Stroke Study: neurologist care is associated with increased testing but improved outcomes. *Neurology* 2003;61:792–796.
9. Moulin T, Berger E, Lemounaud P, et al. Emergency neurology consultations in the university hospital setting: contribution of the neurologist to inpatient management [Article in French]. *Rev Neurol (Paris)* 2000;156:839–847.
10. Mitchell JB, Ballard DJ, Whisnant JP, Ammering CJ, Samsa GP, Matchar DB. What role do neurologists play in determining the costs and outcomes of stroke patients? *Stroke* 1996;27:1937–1943.
11. Ovbiagele B, Goldstein LB, Higashida RT, et al; American Heart Association Advocacy Coordinating Committee and Stroke Council. Forecasting the future of stroke in the United States: a policy statement from the American Heart Association and American Stroke Association. *Stroke* 2013;44:2361–2375.

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