Changes in Medicare Physician Reimbursement for Stroke Procedures from 2000 to 2019

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BACKGROUND: There is limited data regarding financial trends for procedural reimbursement in stroke care. A comprehensive understanding of such trends is important as continued progress is made to advance agreeable reimbursement models in the care of stroke patients.

OBJECTIVE: To evaluate monetary trends in Medicare reimbursement rates for commonly utilized procedures in stroke care from 2000 to 2019.

METHODS: The Centers for Medicare & Medicaid Services was queried for the included Current Procedural Terminology (CPT) codes and reimbursement data were extracted. The CPT codes compiled were the most commonly performed procedures for stroke-related International Classification of Diseases (ICD)-10 codes at our institution (I60-I63). Additionally, data were collected for alteplase and telestroke codes. The rate of change between procedures was compared utilizing an unpaired Student’s t-test. All monetary data were adjusted for inflation to 2019 US dollars utilizing the US Consumer Price Index.

RESULTS: After adjusting for inflation, the average reimbursement for stroke (ICD I60-I63) procedures decreased by 11.2% from 2000 to 2019 (average of −0.43% per year). The adjusted reimbursement rate for included telestroke codes decreased by 12.1% from 2010 to 2019 (average of −1.4% per year). From 2005 to 2019, the reimbursement for alteplase rose by 163.98% (average of +7.3% per year).

CONCLUSION: When adjusted for inflation, Medicare reimbursement for common stroke procedures has decreased from 2000 to 2019. In contrast, reimbursement for alteplase has increased markedly. It is important to be aware of these trends in order to contextualize healthcare economic analyses and inform discussions.

KEYWORDS: Stroke, Telestroke, Telemedicine, Medicare, Reimbursements, Insurance

Provisioning healthcare for patients with stroke is costly,1,2 and stroke-associated costs continue to rise.3 Although hospitals have traditionally been burdened by an unfavorable cost/reimbursement ratio for ischemic stroke, bundled reimbursements by Medicare have helped hospitals financially.4 Medicare covers approximately 72% of all patients with stroke and approximately 75% of the total stroke cost in the USA.5 Currently, hospitals submit Current Procedural Terminology (CPT) codes that correspond to specific procedure(s) performed, and Medicare Services may assign a Diagnosis Related Group (DRG) to the claim depending on the criteria for categorization. These codes are associated with a set dollar amount that Medicare reimburses the provider.6,7 The sum that is reimbursed for a specific service is the product of the number of Relative Value Units (RVUs) and the annually assigned conversion factor that converts RVUs into a cash value. The reimbursement that the provider receives is based on 3 types of RVUs (physician work, practice expense, malpractice trends), which are then summed and multiplied by a geographic modifier.6 These geographic modifiers are intended to adjust reimbursement to...
local differences in the cost of delivering care. Trends in Medicare reimbursement are approximated by private insurance, and so Medicare reimbursement is a reasonable marker of overall market compensation to physicians.

The rate of increase in healthcare costs has prompted policymakers to implement significant legislative changes to Medicare reimbursement policy. Over the past 23 yr, the Sustainable Growth Rate formula has been instated and later replaced, the Medicare Access and Children’s Health Insurance Program (CHIP) Reauthorization Act has been passed in an attempt to link reimbursement to the value of care, and Medicare part D has expanded Medicare coverage to prescription drugs. In the context of these policy changes, this tool provides data on how Medicare reimbursement prices have changed year on year, and has been used to describe reimbursement rates in general surgery, orthopedic surgery, neurosurgery, and radiation oncology, but there is little literature on how stroke reimbursement has changed over the past 2 decades. We conducted this study in order to provide stroke care specialists and stroke centers with information on how these changes may have impacted their practices financially.

METHODS

We first identified the 6 most common CPT codes at our institution (Mayo Clinic, Phoenix, Arizona) for the International Classification of Diseases (ICD) codes 160-163. This range of codes was chosen to cover diagnoses of ischemic and hemorrhagic stroke in the acute setting. These codes carried the following descriptions: 61154: “Pierce skull & remove clot,” 61304: “Open skull for exploration,” 61312: “Open skull for drainage,” 69990: “Microsurgery add-on,” 61322: “Decompressive craniotomy,” and 61645: “Perq art m-thrombect &/nfs.” We chose these 6 because they were specific to stroke care, and because there was a sharp decline in frequency of use for the most common CPT codes from the seventh code onward. Additionally, we collected reimbursement information for recently introduced telestroke CPT codes from 2010 to 2019. Yearly prices corresponding to each CPT code were obtained from the Physician Fee Schedule Look-Up Tool, which is publicly available on the Centers for Medicare & Medicaid Services (CMS) website. This tool provides Medicare reimbursement fees from over 100 centers across the USA from the year 2000 onward. We included all Medicare Administrative Contractor options and modifiers for each reimbursement rate. Differences in geographical modifiers were averaged to reflect an overall trend in reimbursement rates across the USA. The reimbursement for alteplase infusion was obtained from the yearly Average Sales Price (ASP) drug pricing files from the CMS website. Alteplase was chosen because it is the standard medication at our institution to lyse clots in the setting of acute ischemic stroke. All monetary data were adjusted for inflation—increased by an average of 1.93%. From 2005 to 2019, the reimbursement for alteplase rose by 191.02%. From 2000 to 2019, the reimbursement for telestroke codes decreased by an average of –12.06% from 2010 to 2019, and alteplase reimbursement increased by 163.98% from 2005 to 2019 (Table 1, Figures 1 and 2). On average, reimbursement for common CPT codes for ICD-10 codes 160-163 increased by an average of 21.62%. From 2010 to 2019, mean reimbursement for telestroke codes increased by an average of 1.93%. From 2005 to 2019, the reimbursement for telestroke codes, and 0.25 for alteplase, indicating that alteplase value was an average of 0.37 for stroke procedures, 0.40 for telestroke codes, and 5.24% for alteplase. The average CAGR was –0.66% for stroke procedures, –0.67% for telestroke codes, and 5.24% for alteplase. The average reimbursement for the most common CPT codes for ICD-10 codes 160-163 increased for inflation changed −0.43% per year (2000-2019), telestroke codes changed −1.41% per year (2010-2019), and alteplase reimbursement grew by 7.32% per year (2005-2019). The average CAGR was –0.66% for stroke procedures, –0.67% for telestroke codes, and 5.24% for alteplase. The R-squared value was an average of 0.37 for stroke procedures, 0.40 for telestroke codes, and 0.25 for alteplase, indicating that alteplase reimbursement rates have had a less linear trajectory than the other codes we have analyzed as a whole.

We analyzed the average percent change in adjusted reimbursement between 2000 to 2009 and 2010 to 2019 in subgroups. From 2000 to 2009, reimbursement for CPT codes in our study dropped by an average of −12.33%, while alteplase rose by 2.59%. (Only alteplase codes were available from 2005, and telestroke codes did not go into effect until 2010.) From 2010 to 2019, reimbursement for CPT codes for ICD-10 stroke codes declined by −1.19% on average, while alteplase rose by 157.33%.

\[
\text{CAGR} = \left( \frac{\text{2019 value}}{\text{2019 value}} \right)^{\frac{1}{2019-2000}} - 1.
\]

Data were analyzed using SPSS Statistics for Windows, Version 23.0, IBM Corp, Armonk, New York. Statistical significance was set at \( P < .05 \). Institutional review board approval was not required for this study as all utilized data are publicly available. No patient data were used in this study so patient consent was not sought out.

RESULTS

From 2000 to 2019, mean nationwide reimbursement for the most common CPT codes at our institution for ICD-10 codes 160-163 increased by an average of 21.62%. From 2010 to 2019, mean reimbursement for telestroke codes increased by an average of 1.93%. From 2005 to 2019, the reimbursement for alteplase rose by 191.02%. From 2000 to 2019, the CPI—a marker of inflation—increased by 49.12%. When reimbursements were adjusted for inflation to 2019 US dollars, reimbursement for CPT codes for ICD-10 codes 160-163 decreased by an average of −11.18% from 2000 to 2019, telestroke codes decreased by an average of −12.06% from 2010 to 2019, and alteplase reimbursement increased by 163.98% from 2005 to 2019 (Table 1, Figures 1 and 2). On average, reimbursement for common CPT codes for ICD-10 codes 160-163 adjusted for inflation changed −0.43% per year (2000-2019), telestroke codes changed −1.41% per year (2010-2019), and alteplase reimbursement grew by 7.32% per year (2005-2019). The average CAGR was –0.66% for stroke procedures, –0.67% for telestroke codes, and 5.24% for alteplase. The R-squared value was an average of 0.37 for stroke procedures, 0.40 for telestroke codes, and 0.25 for alteplase, indicating that alteplase reimbursement rates have had a less linear trajectory than the other codes we have analyzed as a whole.

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TABLE 1. Included Procedures and Inflation-Adjusted Change to Reimbursement Rate from 2000 to 2019.

| ICD-10 code | CPT code | Procedure | Adjusted reimbursement rate, 2000 to 2019 (if data available) |
|-------------|----------|-----------|--------------------------------------------------|
| ICD 160-162 | 61 154   | Pierce skull and remove clot | −20.9% |
|             | 61 304   | Open skull for exploration   | −22.2% |
|             | 61 312   | Open skull for drainage      | −9.8%  |
| ICD 160-163 | 69 990   | Microsurgery add-on          | −20.7% |
| ICD 163     | 61 322   | Decompressive craniotomy     | +3.5% (2003-2019) |
|             | 61 645   | Perq art m-thrombect &/nfs   | +3.0% (2016-2019) |
| Telesstroke  | G0425    | Inpt telehealth consult 30m  | −12.3% (2010-2019) |
|             | G0426    | Inpt telehealth consult 50m  | −12.4% (2010-2019) |
|             | G0427    | Inpt telehealth con 70/>-m    | −11.5% (2010-2019) |
|             | J02997   | Alteplase Recombinant        | +163.98% (2005-2019) |

FIGURE 1. Inflation-adjusted change to reimbursement rate from 2000 to 2019 for stroke management.

DISCUSSION

Our study analyzed Medicare reimbursement trends for stroke care in the USA from 2000 to 2019. Our results demonstrated that, when adjusted for inflation, the reimbursement amount for the most common CPT codes at our institution for stroke care dropped by about −11%. Reimbursement for telesstroke codes has decreased by an average of 12% since their introduction in 2010. In contrast, Medicare reimbursement for alteplase has gone up by almost 164% since 2005.

CMS employs 2 different mechanisms to determine reimbursement pricing for the results we reported. First, the Relative value scale Update Committee (RUC) meets on a periodic basis to review the valuation of CPT codes. This committee currently (January 2020) consists of 31 members who are representatives of different medical specialties that are mostly chosen by societies of different medical specialties. The recommendations of the RUC for changes in reimbursement have historically been accepted by the CMS over 90% of the time. The RUC has come under criticism for its small size, lack of transparency, inherent conflict of interest, and survey-based methodology.

Second, the CMS uses data reported by drug manufacturers to determine the average sales price for a given medication, and then reimburses 106% of that price. This discrepancy between methods of determining procedure and medication reimbursement rates might have contributed to the difference observed in the alteplase reimbursement vs stroke
procedure reimbursements over the past few decades. Other research points to further sources of pharmaceutical price inflation such as pharmaceutical marketing, increased DRG reimbursement for stroke care, generally rising healthcare costs, an effective monopoly because of prohibitive overhead or patented production processes, \(^{18}\) and the concept of charge compression—in which the price of relatively inexpensive items is more likely to increase in terms of percent of original cost. \(^{19}\)

There have been several policy changes over the past 23 yr that are important to contextualize changes in provider reimbursement rates. In order to control increasing costs, the Congress passed the Balanced Budget Act of 1997. \(^{20}\) Included in the Balanced Budget Act was a policy stating that Medicare reimbursement rates would be determined by the sustainable growth rate (SGR) formula. \(^{6}\)

SGR was criticized for calculations based on the US budget from 1997 and because healthcare costs grew at a faster rate than GDP every year after the year 2000 (except for the 2009-2010 fiscal year). \(^{6}\) Triggered by rising medical costs and an economic recession, this system led to a $−4.8\%$ reduction in Medicare reimbursement rates in 2002 \(^{21}\) (Figure 1). Every year after 2002 until the repeal of SGR, Congress would override the scheduled reimbursement cut, a ritual that came to be known as the “doc fix.” \(^{22}\) Furthermore, the SGR legislation may have had a larger impact on procedural reimbursement, as one of the goals of the legislation was to stabilize a perceived imbalance between procedural reimbursement and that for evaluation and management codes. This was done under budget neutrality, which, in a zero-sum system, decreased procedural reimbursement while concurrently increasing reimbursement for evaluation and management. \(^{21}\) In 2015, the SGR was repealed and the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) was passed. This new legislation initiated a minimum 0.5\% increase in physician reimbursement per year, as well as introduced alternative payment incentives and models. \(^{10}\)

Over this time period, there were several other significant changes made that affected physician reimbursement rates. The Medicare Improvements for Patients and Providers Act of 2008 prevented cuts in physician reimbursement for the second half of 2008 and increased physician reimbursement for 2009, albeit by only 1.1\%. This change played some part in the relative uptick in reimbursement observed between 2006 and 2010 (Figure 1).

In 2003, President Bush signed the Medicare Prescription Drug, Improvement, and Modernization Act, which allowed for Medicare enrolment in prescription drug programs (Medicare Part D) starting January 1, 2006. \(^{31}\) Medicare Part D is relevant to physician reimbursement because, starting in 2006, the Medicare budget took on a new category of expenditures to fund this initiative. As this funding for Medicare Part D is separate from the physician payments under Part B, the structure allowed for increased spending allocated toward Part D, while concurrent decreased spending occurred in Medicare Part B. \(^{23}\) Although the mechanisms for reimbursement of physician services and pharmaceuticals such as alteplase are separate, our results demonstrate an evident discrepancy between the rate of change of alteplase reimbursement and the rate of change of procedure reimbursement (Figure 3). To better understand this discrepancy, we conducted a subanalysis of 2000 to 2009 and 2010 to 2019. The results pertaining to stroke procedures occurred between 2000 and 2009, while the greatest increase in alteplase reimbursement took place between 2010 and 2019. The results pertaining to stroke procedures may be partially attributed to the SGR and its repeal. Reimbursement for alteplase rose at the highest rate in the second decade of the 2000s, but has shown some signs of leveling off over the past two years. Nonetheless, this impressive growth rate should be considered when deciding how to justly split healthcare costs.

In terms of just allocation of resources, it has been shown that patients who are of lower socioeconomic status tend to be treated at lower-volume hospitals, where they are less likely to receive...
proper treatment and more likely to suffer greater morbidity and mortality. In this context, telestroke services can be effective in providing the expertise of a high-volume practice to low-volume institutions. Investment in telehealth and other improvements in delivery of stroke care in the USA may be a contributor to the decreasing burden of stroke in the USA compared to other countries. Our analysis showed that Medicare reimbursement for telestroke consults is declining. It is pertinent that decreased physician and hospital compensation can lead to a need to see more patients and thus shorten patient encounters. This can be to the detriment of individual quality of care. Telestroke has been shown to be a cost-effective model of treatment when the outcome is disability and quality-adjusted life years. Given the cost-effectiveness of telehealth services, it is reasonable to believe that further investment and reimbursement in telehealth services may increase access to and decrease costs of stroke care across the US healthcare system.

The decreasing physician reimbursement for stroke care presented in this study may be unsustainable, and could lead to decreased access to quality stroke services and care for patients in the USA. It is important to evaluate these trends through the lens of the global healthcare economy, as this decreasing reimbursement has occurred concurrently alongside increased practice expenses of over 60% when adjusted for inflation over the same period. It remains to be seen whether the alternative payment models promulgated by the Affordable Care Act and MACRA legislation will have a measurable impact on reimbursement, moving forward, and this will remain an important area of future study.

Limitations

The present study contains several potential limitations. As this study includes only Medicare reimbursement data, the trends reported may not wholly extrapolate to the full insurance market. As mentioned in the Introduction, Medicare covers the majority of stroke costs in the USA and private insurance bill rates approximate Medicare standards, and so we feel these data remain largely representative of the US market. Other limitations include the fact that several of the codes began to be reimbursed midway through the study period, and therefore these codes do not have complete reimbursement data for every year in the study. Each available data point was utilized, and the trends presented are maximally representative of the field. Future studies could benefit from comparing trends within different areas of the country, as well as defining trends for total hospital charges, payments, and utilization of stroke services billed to Medicare.

CONCLUSION

In this study, we demonstrated the Medicare reimbursement trends for stroke care over the past 2 decades in the USA. We believe it is important to monitor changes in physician and hospital reimbursement over the coming years in order to advocate for payment rates that will lead to sustainable, high-value stroke care.

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The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

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COMMENTS
The authors of “Changes in Medicare Physician Reimbursement for Stroke Procedures from 2000-2019 reviewed annual Medicare reimbursement for 6 stroke-related procedural CPT codes from 2000-2019. They concluded that, although actual payment increased by 21.62%, when adjusted for inflation the real effect was an average decrease of 11.18% over 20 years. These findings should be examined within the perspective of changes in Medicare reimbursement for all procedural services between 2000 and 2019. First, the Medicare conversion factor was kept steady at roughly $35, which accounted for an approximately 50% cost of living reduction, based on the rise in the MEI (Medicare Economic Index). Medicare price control by across the board virtual fee cuts by eliminating inflation-adjustment annual increases has been a bedrock strategy of Medicare cost reduction by gradual attrition. More pointedly, Medicare has targeted virtually all surgical procedures as being historically overpriced compared to Evaluation & Management services, and has steadily chipped away at CPT reimbursement for work and practice expense components of surgical CPT RVUs for the 2000-2019 period. From 2000-2018, the 20 most common neurosurgical cranial and spinal CPT codes dropped an average of 25%; or −1.6% per year. The authors are commended for disclosing the effect Medicare payment policy has on an emerging, highly valuable procedural technology (endovascular therapy). Unfortunately, exposing price reductions historically has had little effect on halting or reversing Medicare price controls.

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Warren Buffet called rising health care costs a “tapeworm” on the U.S. economy since it was as high as 16-17% of the GDP prior to COVID-19. The authors work sheds light on a silent negative sums game and devalues our efforts to help our patients. It is time that Medicare and Congress eliminate growing health care administrative costs, and in parallel, adjust health care reimbursement with inflation to make it sustainable for future generations of Americans.

The authors have presented an illustration of trends in Medicare reimbursement for ischemic and hemorrhagic stroke management during the last two decades. After adjusting for inflation, the authors found that reimbursement for 6 common CPT codes decreased by 11% from 2000 to 2019. In addition, a 12% decrease in reimbursement for telestroke CPT codes was noted from 2010 to 2019. On the contrary, compensation for alteplase increased by 164% from 2005 to 2019.

The results are worrisome and put current strategy of compensating for management of a disease of such prevalence and morbidity into perspective. Decreasing reimbursement of hospitals for treating patients with stroke will have a negative impact on quality of care. It will also continue the trend we have seen from Medicare: large increases in payments to device makers and pharmaceutical companies, concomitant with decreases in payments to hospitals, physicians, and care providers. The ultimate result will be a more corruptible and unequal healthcare system.

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