Traditional Medicare Spending on Inpatient Episodes as Hospitalizations Decline

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OBJECTIVE: To describe Medicare inpatient episode spending trends between 2009 and 2017 as inpatient use declined among traditional Medicare beneficiaries.

METHODS: Inpatient episodes included claims for all traditional Medicare inpatient, outpatient, and Part D services provided during the 30 days prehospitalization, the inpatient stay, and the 90 subsequent days. We describe the mean number of episodes per 1000 beneficiaries, mean episode-related spending per beneficiary, and mean spending per episode for all beneficiaries and for specific populations and types of episodes. Spending measures are reported with and without adjustment for payment rate increases over the study period.

RESULTS: The number of inpatient-initiated episodes per 1000 beneficiaries declined by 18.2% between 2009 and 2017 from 326 to 267. After adjusting for payment rate increases, Medicare spending per beneficiary on episode-related care declined by 8.9%, although spending per episode increased by 11.4% over this period. Between 2009 and 2017, all subgroups defined by age, sex, race, or Medicaid status experienced declines in inpatient use accompanied by decreased overall episode-related spending per beneficiary and increased spending per episode. Larger declines in the number of episodes per 1000 beneficiaries were seen among episodes that began with a planned admission (28.8%) or involved no use of post–acute care services (23.9%). When comparing admissions according to medical diagnosis, the largest decline occurred for episodes initiated by a hospitalization for a cardiac or circulatory condition (31.8%).

CONCLUSION: Medicare inpatient episodes per beneficiary decreased, but spending decreases due to declining volume were offset by increased spending per episode. *Journal of Hospital Medicine* 2021;16:652-658.

The rate of inpatient admissions among adults aged 65 years and older has decreased by approximately 25% since 2000.[1,2] This long-term trend raises important questions about inpatient-related spending in the traditional Medicare program for hospitals and providers who treat beneficiaries after a hospitalization. As traditional Medicare's most expensive sector (accounting for 21% of all Medicare spending[3]), reducing hospitalizations is often championed as an opportunity to moderate Medicare spending growth.

Medicare's ability to achieve significant savings from declining inpatient use may be tempered by a shift toward more expensive hospitalizations. If marginal hospitalizations among healthier beneficiaries are avoided, then the remaining inpatient users may be sicker and have greater spending per hospitalization and greater need for follow-up services. This study examines trends in Medicare spending related to episodes initiated by an inpatient stay because of its importance to overall Medicare spending and the implications for several Medicare value-based payment initiatives. In care models seeking to contain spending at a population level, such as accountable care organizations and managed care plans, reducing inpatient use and associated services may have the largest impact in curbing overall spending growth per beneficiary. Other models focused on spending at an episode level, including bundled-payment initiatives, may face challenges if inpatient episodes become more expensive over time.

As Medicare shifts toward value-based payments, hospitalists and other hospital leaders are often involved in redesigning care delivery models for the hospital or accountable care organization (eg, through readmission reduction initiatives, post–acute care coordination, and bundled-care delivery programs). Not all savings strategies rely on providers to change how services are delivered; Medicare can modify payment rates, such as Affordable Care Act provisions that slowed how quickly Medicare payment rates increased.[4] For clinicians to navigate the shift toward new payment models, it is important to recognize how each of these elements—declining hospital admissions, spending per inpatient episode, and payment rates—affect spending trends for inpatient services and associated care. Previous articles on overall Medicare inpatient spending have examined inpatient stays alone[5] or focused mainly on spending per episode[6,7] without quantifying how these elements contributed to overall episode-related

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Medicare spending per beneficiary. This article addresses this gap by demonstrating how inpatient-related spending trends reflect each component.

This study examined trends in Medicare's spending on inpatient episodes during the years 2009 to 2017. We described changes in the volume and spending on inpatient-initiated episodes across several dimensions, including beneficiary-level and hospitalization-level factors. We examined whether declines in spending associated with fewer inpatient-initiated episodes have been offset by increased spending per episode and how spending would have differed without changes in Medicare payment rates.

METHODS

Episode Definition

We constructed an episode measure that captured traditional Medicare spending for 30 days prior to hospital admission, hospitalization duration, and 90 days following hospital discharge (additional details in the Appendix). As with bundled payments that include pre- and postdischarge services, this window allowed us to observe any services that preceded or followed a hospitalization. Using Medicare Part A, B, and D claims data for the years 2008 to 2018, we captured spending across all sectors for episodes with an index hospital admission in the years 2009 to 2017. If a beneficiary died during an episode, we measured healthcare spending until death. We excluded episodes where beneficiaries did not have traditional Medicare Part A and B for the entire episode or lived outside the 50 states or Washington, DC.

Any acute hospitalization triggered a new episode, with one exception: if a beneficiary was discharged and readmitted within 90 days for the same diagnosis related group (DRG), then the readmission did not trigger a new episode. The spending for that readmission was attributed to the prior hospital stay. In effect, the annual number of episodes is equivalent to the annual number of hospital admissions minus subsequent rehospitalizations for the same DRG. Neither observation stays nor hospitalizations in inpatient rehabilitation, psychiatric, or long-term facilities were considered acute hospital admissions.

We assigned claims from noninpatient sectors to an episode based on whether the claim start date fell within the episode window. All traditional Medicare sectors were measured, including outpatient services, physician claims, post–acute care services, and Medicare Part D prescription drug events.

Our analysis aimed to measure all spending related to inpatient episodes without double-counting spending for overlapping episodes. If episodes overlapped, then spending for overlapping days was weighted to be evenly divided across episodes.

Outcome Measures

The study's main outcomes summarized episode trends across the entire traditional Medicare population, including beneficiaries without an episode, in annual mean number of episodes per beneficiary and annual mean episode-related spending per beneficiary. The denominator of these measures is person-years, or total number of beneficiary months with Medicare Part A and B coverage divided by 12. The annual mean number of episodes per beneficiary is the total number of episodes initiated in a calendar year divided by person-years. The annual mean episode-related spending per beneficiary is the total amount of spending attributed to episodes divided by person-years. We also measured annual mean spending per episode, or total amount of spending attributed to episodes divided by the total number of episodes.

Medicare annually updates each sector's payment rates for several factors, including inflation. We constructed an index for each sector to adjust for these annual payment rate changes. We also accounted for sequestration measures in effect since April 2013 that reduced Medicare payments to all sectors by 2%. We report our spending measures twice, with and without adjusting for changes in payment rates. Adjusted numbers reflect payment rates in effect in 2015.

Analysis Approach

We present annual trends on changes in the number of inpatient episodes per beneficiary, mean episode-related spending per beneficiary, and mean spending per episode. To quantify how changes in episode-related spending per beneficiary reflect changes in the number of episodes per beneficiary vs changes in spending per episode, we modified an approach implemented by Rosen and colleagues.[8] We calculated how much episode-related spending per beneficiary would have changed between 2009 and 2017 if spending per episode remained at 2009 levels but the number of episodes per beneficiary declined, as observed between 2009 and 2017 (see example calculation in Appendix). Conversely, we estimated how much episode-related spending per beneficiary would have changed if the number of episodes per beneficiary remained at 2009 levels but spending per episode increased, as observed between 2009 and 2017. In reality, the number of episodes per beneficiary and spending per episode concurrently changed, so the decomposition also includes an interaction term that quantifies how much of the change in spending reflects changes in both factors. We present these estimates for all sectors and separately for inpatient and all other sectors.

To better understand which beneficiaries have declining inpatient use, we performed stratified analyses describing changes in the number of episodes per beneficiary between 2009 and 2017, spending per episode, and total episode-related spending per beneficiary. We report these measures for several subpopulations defined by age, sex, race, dual-eligible status, and whether the beneficiary used long-term nursing home services during the episode's calendar year. Descriptive statistics also detail how these measures changed between 2009 and 2017 for episodes stratified by characteristics of the index hospital stay: planned vs unplanned, medical vs surgical, and any use of intensive care unit (ICU) or coronary care unit services. We also stratify study measures by whether an episode included any use of post–acute care services (skilled nursing facility, home health, or inpatient rehabilitation facility use). Finally, we aggregate the episodes into major diagnostic categories (MDCs) based on the index hospital stay's DRG

TABLE 1. **Annual Volume of Inpatient Episodes and Associated Spending, 2009-2017**

	Annual amount					Change from previous year			
Year	Total number of episodes	Total number of beneficiaries	Mean no. of episodes per 1000 beneficiaries	Mean spending per episode, $	Mean episode-related spending per beneficiary, $	Total episodes, %	Mean no. of episodes per 1000 beneficiaries, %	Mean spending per episode, %	Mean episode-related spending per beneficiary, %
2009	10,201,318	31,293,596	326	20,891	6810	NA	NA	NA	NA
2010	10,177,843	31,694,974	321	21,221	6815	–0.2	–1.5	1.6	0.1
2011	10,052,967	32,067,795	313	21,436	6720	–1.2	–2.4	1.0	–1.4
2012	9,625,778	32,456,685	297	21,753	6451	–4.2	–5.4	1.5	–4.0
2013	9,258,378	32,676,260	283	22,468	6366	–3.8	–4.5	3.3	–1.3
2014	9,018,031	32,728,685	276	22,896	6309	–2.6	–2.8	1.9	–0.9
2015	8,959,313	32,830,905	273	22,913	6253	–0.7	–1.0	0.1	–0.9
2016	8,917,283	33,261,920	268	23,219	6225	–0.5	–1.8	1.3	–0.4
2017	8,838,208	33,143,921	267	23,273	6206	–0.9	–0.5	0.2	–0.3
Net change, 2009-2017						–13.4	–18.2	11.4	–8.9

Analysis of traditional Medicare claims data. The episode window includes 30 days prior to hospitalization, hospital admission, and 90 days after discharge. Total number of beneficiaries is reported in person-years (total months of Medicare Part A and B participation for entire study population divided by 12). Spending includes all Medicare A and B sectors, including Part D spending. Spending measures adjusted for payment rate changes between 2009 and 2017. Relative changes from previous year are calculated based on unrounded values and cannot be directly calculated based on the rounded values reported in the annual amount columns.

to report study outcomes by condition. Because of a shift in coding hospitalizations for pneumonia as sepsis,[9,10] we exclude these two diseases from their respective MDCs and analyze them jointly as a unique category.

RESULTS

Changes in Number of Inpatient Episodes and Related Spending

From 2009 to 2017, the number of inpatient episodes per 1000 traditional Medicare beneficiaries declined from 326 to 267 (Table 1), or a relative decline of 18.2% (Figure 1). The total volume of inpatient episodes declined by only 13.4%, from 10.2 million to 8.8 million, reflecting that the size of the traditional Medicare population grew during these years. Over the same years, mean payment-rate–adjusted spending per episode increased 11.4% from $20,891 to $23,273.

When considering overall episode-related spending, the large decline in the volume of episodes outweighed increased spending per episode: the mean amount of episode-related Medicare spending per beneficiary decreased 8.9% from $6810 to $6206 (Table 1), or a net change of $604 (Figure 2). This net change reflects decreased spending due to fewer episodes per beneficiary ($1239 reduction in episode-related spending) offset by increased spending per episode (translating to a $776 increase in episode-related spending per beneficiary). These two factors, plus their interaction reflecting the combined influence of these factors ($141), comprise the overall change in episode-related spending per beneficiary over this period.

When these estimates are calculated separately for the inpatient sector and all other sectors, the inpatient sector experienced small increases in spending associated with greater spending per episode ($304) compared with noninpatient sectors ($472). Accordingly, the inpatient sector had a larger net decline in episode-related spending per beneficiary ($420) than noninpatient sectors ($184) after taking into account declining episode volume.

As expected, episode-related spending increased more when measures were not adjusted for annual payment rate increases. Without such adjustment, mean spending per episode increased 25.5%, and episode-related spending per beneficiary was nearly flat (2.6% between 2009 and 2017 [Figure 1]). The decline in unadjusted spending associated with fewer episodes ($1138) was offset by the spending increase associated with higher spending per episode ($1592) (Figure 2).

Analyses Stratified by Beneficiary Characteristics

Every population examined had declines in the number of inpatient episodes, even beneficiaries with more frequent inpatient use (Table 2). Among Medicare beneficiaries aged 85 years and older, the mean number of episodes per 1000 beneficiaries declined by 12.7%, from 524 to 457. Populations with less frequent inpatient use often experienced larger relative declines in number of episodes than populations with more frequent inpatient use. For example, the mean number of episodes per 1000 beneficiaries decreased by 17.7% for beneficiaries without nursing home use (306 to 252), as compared with an 8.1% decline for beneficiaries with nursing home use (from 888 to 816). In contrast, populations with less frequent inpatient use had larger relative increases in spending per episode with adjustment for payment rate changes. For

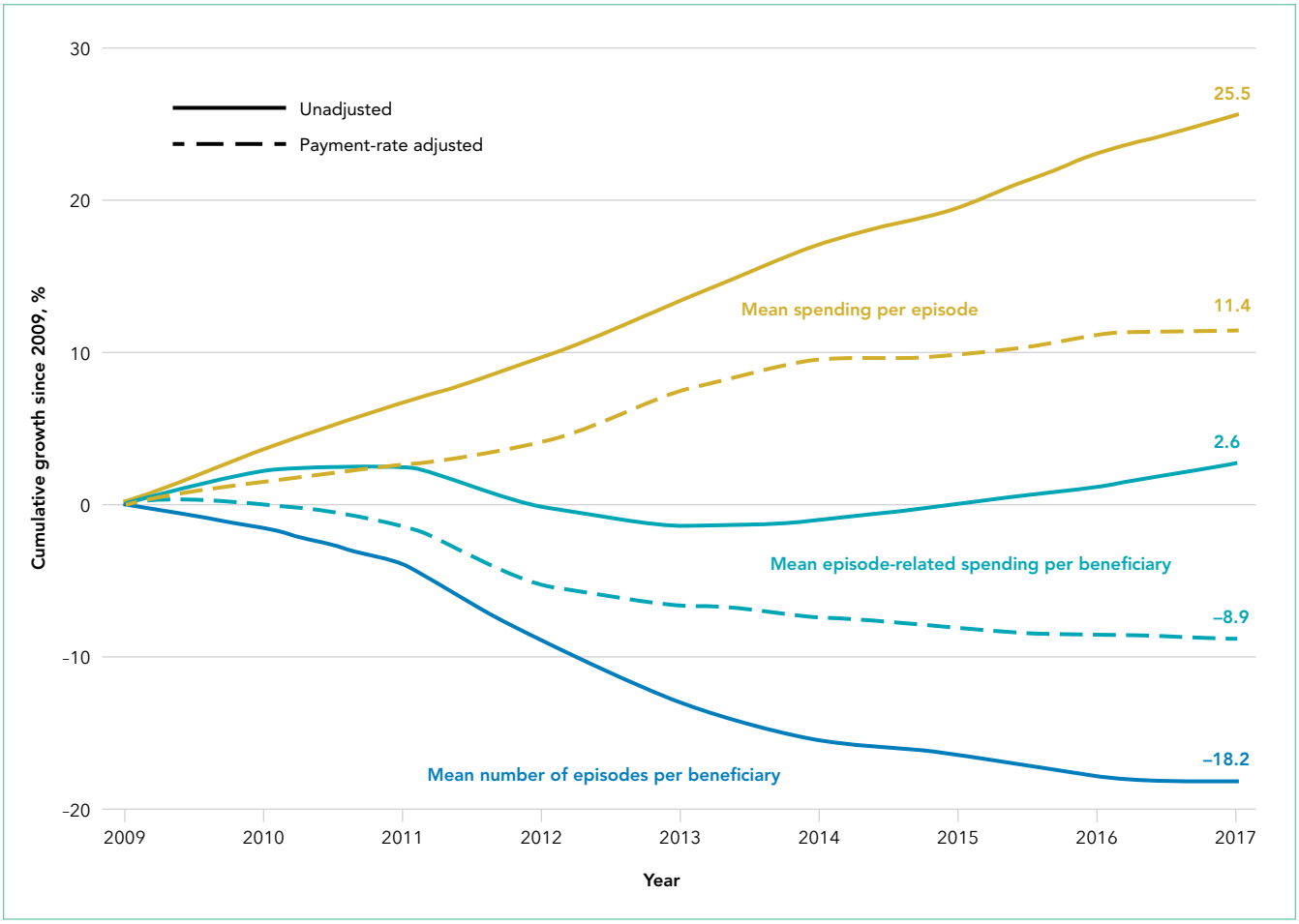

FIG 1. Relative Growth in Annual Volume of Episodes and Associated Spending, 2009-2017. The authors' analysis of traditional Medicare claims data is illustrated. The episode window includes 30 days prior to hospitalization, hospital admission, and 90 days after discharge. Spending includes all Medicare A and B sectors, including Part D spending. Payment-rate adjusted spending measures reflect Medicare spending absent any payment rate changes between 2009 and 2017.

example, spending per episode increased by 13.1% for beneficiaries aged 65 to 74 years ($20,904 to $23,644), but only by 8.6% for beneficiaries 85 years and older ($20,384 to $22,138).

Analyses Stratified by Service Use Characteristics

Some types of inpatient episodes had larger declines in the number of episodes, including episodes with planned admissions for the index hospital stay (28.8% decline from 68 to 48 episodes per 1000 beneficiaries) and episodes without post–acute care use (23.9% decline from 169 to 129 episodes per 1000 beneficiaries) (Appendix Table). In contrast, declines in the number of episodes were similar for index hospital admissions that did or did not involve ICU use (17.8% and 18.3% reduction in mean number of episodes per 1000 beneficiaries, respectively) or that included a surgical procedure or not (17.1% versus 18.6%, respectively). Several types of inpatient episodes had larger increases in spending per episode, such as a 15.1% increase for planned admissions and a 13.2% increase for hospitalizations without ICU use.

According to diagnosis information for an episode's index hospital stay, inpatient episodes related to conditions affecting the circulatory system had the largest decline in mean number of episodes, decreasing by 31.8% from 78 to 53 episodes per 1000 beneficiaries (Appendix Table). Episodes for other diseases had much smaller declines in volume. Admissions for diagnoses of pneumonia or sepsis had notable increases in the volume of episodes, increasing by 20.7% from 25 to 30 admissions per 1000 beneficiaries.

DISCUSSION

Medicare spending per beneficiary on inpatient episodes, including services provided pre- and post hospitalization, declined by 8.9% from 2009 to 2017 after adjusting for payment rate changes. This decline reflects two components. First, the number of episodes per 1000 beneficiaries declined by 18.2%. Although the extent of this decrease varied across populations, every group examined had declines in inpatient use. In particular, hospitalizations for conditions affecting the circulatory system, such as heart attacks and cardiac procedures, decreased. Second, as inpatient volume declined, spending per episode increased by 11.4% to an average of $23,273 in 2017. This increase in spending per episode offset how much overall Medicare spending on episode-related care declined.

Medicare is increasingly challenging hospitals to demonstrate the value of inpatient services and associated treatment, which

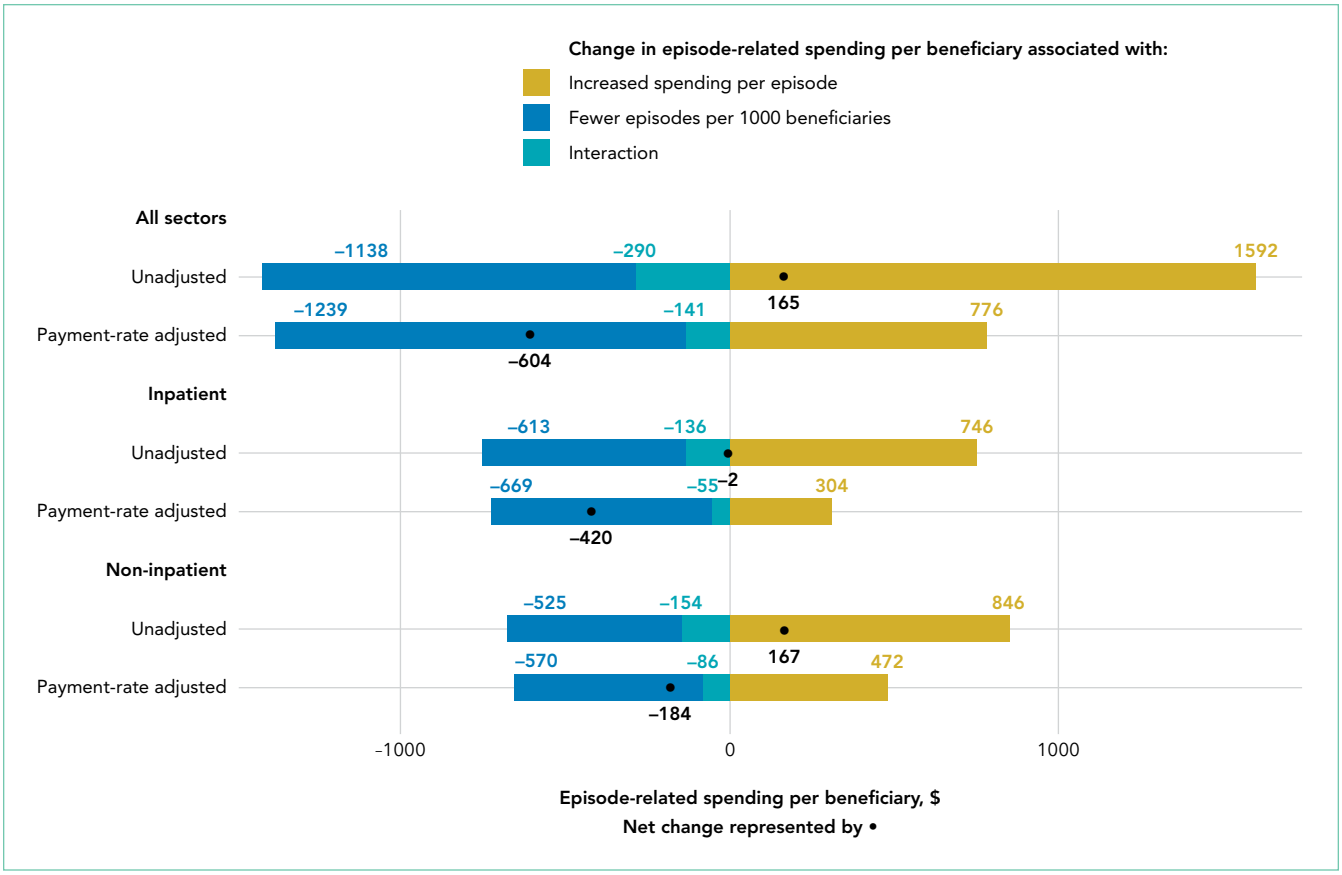

FIG 2. Change in Episode-Related Spending per Beneficiary Associated With Changes in Volume and Spending per Episode, 2017 vs 2009. The authors' analysis of traditional Medicare claims data is illustrated. The net change in episode-related spending per beneficiary is the sum of the terms that represent changes associated with increased spending per episode, fewer episodes per 1000 beneficiaries, and an interaction between these factors. The episode window includes 30 days prior to hospitalization, hospital admission, and 90 days after discharge. Spending includes all Medicare A and B sectors, including Part D spending. Spending measures adjusted for payment rate changes between 2009 and 2017.

requires hospital leaders to recognize how their facilities' spending trends relate to these national patterns. Understanding how much national episode-related spending has decreased over time with declining inpatient volume can help an accountable care organization evaluate whether it is feasible to achieve significant savings by reducing hospitalizations. Bundled-payment providers focused on managing spending per episode can benefit from identifying which types of hospitalizations have increased spending per episode, especially for certain diagnoses.

These results also highlight the continued importance of a perennial factor in Medicare spending: payment rates. If Medicare payment rates had not increased over our study period, Medicare spending per inpatient episode would have increased by only 11%. Actual Medicare spending per episode increased by 25%, demonstrating that over half of the relative increase in spending per episode reflected increases in Medicare's payment rates.

Increased spending per episode, even after adjustment for payment rate changes, suggests that services provided during an episode have increased in intensity or shifted toward higher-cost treatments. In order to understand how Medicare episode-related spending changed without introducing assumptions about factors underlying that change, our analysis did not adjust for inpatient acuity. We observed a smaller decline in the volume of hospitalizations with post–acute care use but similar decreases in the volume of hospitalizations with and without ICU use. This finding is consistent with previous evidence suggesting inpatient acuity has increased, with some caveats. The case-mix index for inpatients increased in Medicare claims,[11] but some of this increase may reflect expanded opportunities for hospitals to document comorbidities.[12] Geographic areas with larger decreases in inpatient admissions between 2010 and 2013 experienced greater risk-adjusted mortality among inpatients, consistent with a higher level of acuity among inpatients.[13] The volume of ICU admissions declined, but ICU patients were more likely to have organ failure and to use complex services, such as mechanical ventilation, than patients admitted in earlier years.[14]

When interpreting these trends, several points are notable. The underlying health of the Medicare population may contribute to declining inpatient use but is difficult to quantify. The observed decline in cardiac-related hospitalizations is consistent with evidence that the impact of ischemic heart disease, the leading source of disease or injury in the US population, has dramatically declined over recent decades[15] and that the Medicare program has experienced large declines in overall spending and use related to cardiac conditions.[16-18]

TABLE 2. **Annual Volume of Episodes and Associated Spending by Beneficiary Characteristics, 2009-2017**

	Mean episodes per 1000 beneficiaries, No.			Mean spending per episode, $			Mean episode-related spending per beneficiary, $		
	2009	2017	Relative change, %	2009	2017	Relative change, %	2009	2017	Relative change, %
Age, y									
64 and under	334	294	–12.0	21,549	24,156	12.1	7203	7101	–1.4
65-74	228	186	–18.4	20,904	23,644	13.1	4759	4391	–7.7
75-84	365	300	–18.0	20,860	23,161	11.0	7620	6942	–8.9
85+	524	457	–12.7	20,384	22,138	8.6	10,681	10,126	–5.2
Sex									
Female	330	265	–19.6	20,548	22,742	10.7	6785	6035	–11.0
Male	321	268	–16.4	21,341	23,911	12.0	6843	6413	–6.3
Race/ethnicity									
Black	407	330	–18.8	22,950	25,289	10.2	9330	8343	–10.6
Hispanic	318	261	–17.8	24,132	26,065	8.0	7663	6802	–11.2
Other race or ethnicity	247	193	–21.9	24,102	26,351	9.3	5965	5091	–14.7
White	320	265	–17.4	20,258	22,611	11.6	6489	5982	–7.8
Insurance									
Full Medicaid	500	414	–17.2	23,105	25,365	9.8	11,542	10,491	–9.1
Partial Medicaid	412	346	–16.0	20,158	22,632	12.3	8311	7834	–5.7
No Medicaid	286	235	–18.0	20,169	22,653	12.3	5773	5316	-7.9
Deceased									
Yes	2319	2103	–9.3	22,843	24,091	5.5	52,971	50,661	–4.4
No	275	223	–18.9	20,467	23,089	12.8	5621	5146	–8.5
Nursing home use									
No	306	252	–17.7	20,320	22,748	11.9	6219	5727	–7.9
Yes	888	816	–8.1	26,439	29,242	10.6	23,469	23,853	1.6

Analysis of traditional Medicare claims data. The episode window includes 30 days prior to hospitalization, hospital admission, and 90 days after discharge. Spending includes all Medicare A and B sectors, including Part D spending. Spending measures adjusted for payment rate changes between 2009 and 2015. Relative changes between 2009 and 2017 are calculated based on unrounded values and cannot be directly calculated based on the rounded values reported in the annual amount columns for 2009 and 2017.

Other potential factors include a shift toward hospitals treating Medicare beneficiaries as outpatients during an observation stay instead of admitting them as inpatients. Observation stays have increased as traditional Medicare implemented measures to penalize readmissions and limit payments for short inpatient stays.[19-21] Even so, the increase in observation stays would have to be at least three times as large as described in other work to fully substitute for the decrease in inpatient stays: between the years 2007 and 2018, the number of observation stays per 1000 beneficiaries increased by only 26 stays, whereas the number of hospitalizations per 1000 beneficiaries decreased by 83 hospitalizations.[20]

Outpatient services may also broaden treatment availability in alternative settings or enable beneficiaries to avoid inpatient treatment with appropriate preventative care.[22-27] These considerations are even more relevant as the COVID-19 pandemic spurred reduced admissions and shifted acute services outside of hospitals.[28,29] Some services, such as elective surgeries, have probably shifted from an inpatient to an outpatient setting, which would be consistent with our finding that there are larger relative declines in planned hospitalizations. Although this analysis does not capture spending for outpatient services that are not linked to an inpatient admission, prior work demonstrates that annual growth in total Medicare spending per beneficiary (episode-related or not) has recently declined for the inpatient sector but increased for outpatient and physician sectors.[30] By offering other outpatient services, hospitals may be able to recoup some declining inpatient revenues. However, outpatient services are reimbursed at a lower rate than inpatient services, suggesting these trends may create financial pressure for hospitals.

There are several limitations to our analysis. First, our analysis is not designed to uncover the reason for the shift away from inpatient services nor to analyze how it has affected beneficiaries' overall quality of care. Second, in accounting for payment rate changes, we do not consider that facilities may have changed their behavior in response to payment rate changes. If the profitability of treating Medicare patients declined, then facilities may no longer have as much financial incentive to offer services that attract Medicare beneficiaries as inpatients. Third, our analysis excludes the Medicare Advantage population, which more than doubled over this time period and experienced smaller declines in inpatient use over our study years.[31,32] Fourth, our analysis does not include spending on services provided outside of inpatient episodes, so we do

not estimate how much declines in episode-related spending contributed to overall Medicare spending. Finally, as with the trends noted for sepsis and pneumonia,[9] some of the changes in diagnosis categories might reflect changes in coding practices to ensure that conditions with higher DRG payment rates are listed as the primary diagnosis, even if the actual services rendered or conditions treated did not change.

CONCLUSION

Over an 8-year period, Medicare spending per beneficiary on inpatient episodes, including all services immediately preceding and following hospitalizations, declined by 8.9% after taking into account payment rate increases. This broad shift away from inpatient services among all Medicare beneficiaries suggests policymakers should aim for payment policies that balance financial sustainability for hospitals and associated facilities with more efficient use of inpatient and related services.

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