SPECIAL ARTICLE

Readmissions, Observation, and the Hospital Readmissions Reduction Program

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ABSTRACT

BACKGROUND

The Hospital Readmissions Reduction Program, which is included in the Affordable Care Act (ACA), applies financial penalties to hospitals that have higher-than-expected readmission rates for targeted conditions. Some policy analysts worry that reductions in readmissions are being achieved by keeping returning patients in observation units instead of formally readmitting them to the hospital. We examined the changes in readmission rates and stays in observation units over time for targeted and nontargeted conditions and assessed whether hospitals that had greater increases in observation-service use had greater reductions in readmissions.

METHODS

We compared monthly, hospital-level rates of readmission and observation-service use within 30 days after hospital discharge among Medicare elderly beneficiaries from October 2007 through May 2015. We used an interrupted time-series model to determine when trends changed and whether changes differed between targeted and nontargeted conditions. We assessed the correlation between changes in readmission rates and use of observation services after adoption of the ACA in March 2010.

RESULTS

We analyzed data from 3387 hospitals. From 2007 to 2015, readmission rates for targeted conditions declined from 21.5% to 17.8%, and rates for nontargeted conditions declined from 15.3% to 13.1%. Shortly after passage of the ACA, the readmission rate declined quickly, especially for targeted conditions, and then continued to fall at a slower rate after October 2012 for both targeted and nontargeted conditions. Stays in observation units for targeted conditions increased from 2.6% in 2007 to 4.7% in 2015, and rates for nontargeted conditions increased from 2.5% to 4.2%. Within hospitals, there was no significant association between changes in observation-unit stays and readmissions after implementation of the ACA.

CONCLUSIONS

Readmission trends are consistent with hospitals' responding to incentives to reduce readmissions, including the financial penalties for readmissions under the ACA. We did not find evidence that changes in observation-unit stays accounted for the decrease in readmissions.

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Hospital readmissions within 30 days after discharge have drawn national policy attention because they are very costly, accounting for more than $17 billion in avoidable Medicare expenditures,[1] and are associated with poor outcomes. In response to these concerns, the Affordable Care Act (ACA), which was passed in March 2010, created the Hospital Readmissions Reduction Program. Since October 2012, the start of fiscal year (FY) 2013, the program has penalized hospitals with higher-than-expected 30-day readmission rates for selected clinical conditions. In FY 2013 and 2014, these conditions were acute myocardial infarction, heart failure, and pneumonia. Total hip or knee replacement and chronic obstructive pulmonary disease (COPD) were added in FY 2015. The program penalizes hospitals that have readmission rates that are higher than would be expected on the basis of readmission performance over 3 previous years. For example, FY 2015 penalties are based on readmissions from July 2010 through June 2013. Initially, in FY 2013, the maximum penalty was 1% of a hospital's Medicare base diagnosis-related-group (DRG) payments, but the penalty has been increased to 3% for FY 2015 and the years beyond.

Despite the importance of readmissions, there has been little study of the effect of the program. Published epidemiologic data suggest that overall national rates of readmission decreased through 2012.[2,3] There is also evidence that stays in observation units have increased during this same period.[4,5] Critics of the Hospital Readmissions Reduction Program have worried that hospitals might be achieving reductions in readmissions by keeping returning patients in observation units rather than formally readmitting them to the hospital.[6,7] In this article, we address four hypotheses: that changes in rates of readmission in response to the ACA were greater for targeted conditions than for nontargeted conditions, that the decreasing trend in readmission rates persisted after the initial implementation of the program, that the trends in use of observation units did not change after adoption of the ACA, and that hospitals that had a greater increase in observation-unit stays did not have a greater reduction in readmission rates.

Methods

Data Sources and Study Variables

We used Medicare Part A and Part B claims for fee-for-service beneficiaries 65 years of age or older who were enrolled for 1 year before they had an index hospitalization in an acute care hospital during the period from October 2007 through May 2015. We identified index stays using the inclusion and exclusion criteria for the hospital-wide readmission measure of the Centers for Medicare and Medicaid Services (CMS).[8] We then identified index stays for the three conditions targeted by the Hospital Readmissions Reduction Program (acute myocardial infarction, heart failure, and pneumonia), using the program's inclusion and exclusion criteria.[9] Admissions for total hip or knee replacement and for COPD were excluded from the analysis sample, since these conditions were added to the program only after the first 2 years of implementation. All remaining admissions as specified by CMS criteria were considered to be admissions for nontargeted conditions.

We identified readmissions within 30 days after discharge, using the definition of readmission that is used for the hospital-wide readmission measure of the CMS.[8] We also examined whether patients used observation services within 30 days after discharge. Finally, we looked at the combined outcome of any return to the hospital within 30 days after discharge (either readmission or observation). Readmission and observation-service rates were risk-adjusted with the use of covariates from the CMS hospital-wide readmission measure (age, 31 coexisting medical conditions, and principal discharge diagnosis).[8] The risk-adjusted rates were calculated for each hospital and for each month, for both targeted and nontargeted conditions. We excluded 437 hospitals that did not have admissions for targeted conditions both before and after the passage of the ACA. Additional details are provided in the Supplementary Appendix, available with the full text of this article at NEJM.org.

Statistical Analysis

We first examined patient and hospital characteristics of index hospitalizations for targeted and nontargeted conditions for the first year (October 2007 through September 2008) and the

Table 1. Annual Index Admissions According to Hospital and Patient Characteristics.

Characteristic	Targeted Conditions*		Nontargeted Conditions	
	Oct. 2007–Sept. 2008	June 2014–May 2015	Oct. 2007–Sept. 2008	June 2014–May 2015
Patients (no.)	867,737	756,056	4,523,725	3,887,361
Index admissions (no.)	1,001,634	929,244	6,476,728	5,876,773
Acute myocardial infarction	196,859	189,099		
Heart failure	434,335	418,944		
Pneumonia	370,440	321,201		
Beneficiary risk-adjusted readmission rate within 30 days after discharge (%)	21.5	17.8	15.3	13.1
Beneficiary risk-adjusted percentage using observation services within 30 days after discharge (%)	2.6	4.7	2.5	4.2
Age distribution (%)				
65–74 yr	29.2	31.9	36.6	39.3
75–84 yr	39.8	35.6	39.8	35.3
≥85 yr	31.0	32.5	23.6	25.4
Dual eligibility (%)†	28.2	24.5	24.9	23.4
Male sex (%)	45.6	47.7	41.9	43.7
Nonwhite race (%)‡	17.2	18.3	17.3	18.5
Hospital size (%)				
0–250 beds	47.4	45.8	42.7	40.5
251–500 beds	32.6	33.7	34.7	35.3
≥501 beds	17.1	18.4	20.0	22.3
Type of hospital (%)				
Teaching hospital	47.0	47.7	51.1	52.7
Urban hospital	80.7	83.2	84.3	87.0
For-profit hospital	16.6	16.6	16.2	16.3
Hospital receiving disproportionate share payments (%)	82.3	82.6	82.0	82.7

* The targeted conditions were acute myocardial infarction, heart failure, and pneumonia.
† Dual eligibility denotes enrollment in and eligibility for both Medicare and Medicaid.
‡ Information on race was obtained from the Master Beneficiary Summary File.

last year (June 2014 through May 2015) of the study period (Table 1). In these descriptive statistics, the index hospitalization was the unit of analysis, and patients could have more than one index hospitalization.

We then analyzed the trends in readmissions and observation-unit stays from FY 2008 through May 2015. We based these primary analyses on interrupted time-series models, which we implemented using generalized estimating equations, to examine the linear trends in monthly, hospital-level, risk-adjusted readmission and observation-service rates. In the main analysis, we analyzed the change in trend between time periods, for three separate periods: pre-ACA (October 2007 through March 2010), implementation of the Hospital Readmissions Reduction Program (April 2010 through September 2012), and long-term follow-up after penalties were initiated (October 2012 through May 2015). We also tested a sensitivity model that included an additional 6-month initiation period after adoption of the ACA (April 2010 through September 2010), since hospitals may have taken some time to implement policies to reduce readmissions after the law was passed.

The linear generalized-estimating-equation models used the monthly, hospital-based, risk-adjusted readmission rate as the outcome and included an independent working correlation matrix and robust empirical standard errors to account for within-hospital correlation over time. We modeled the differences in time trends between readmissions for targeted conditions and those for nontargeted conditions, after adjusting for seasonal variation and after weighting by the monthly number of index stays in the hospital. We estimated changes in readmission rates over time using a linear term for time as well as linear splines at each change in time period (April 2010 and October 2012 in the primary model). The model allowed the seasonal effects and time trends to differ between targeted and nontargeted conditions by including interaction terms with type of condition (targeted or nontargeted) and separate initial intercepts for targeted and nontargeted conditions. We used four hypothesis tests during each time period: first, were there significant trends in readmission rates during the time period? Second, did the trend differ between targeted and nontargeted conditions (the interaction between time and targeted or nontargeted conditions) during the time period? Third, within targeted or nontargeted conditions, did the trend during the current time period differ from the trend during the previous time period (based on a statistically significant spline term)? Fourth, did the magnitude of the change in trend between the current and previous time period differ between targeted and nontargeted conditions (the interaction between the change in slope and targeted or nontargeted conditions)? Significance was based on 95% confidence intervals. We used similar models and tests for the other outcomes within 30 days after discharge: use of observation service and any return to the hospital (either readmission or observation).

We then evaluated within-hospital changes in the use of observation services and the changes in readmission rates for targeted conditions during the program implementation period (from April 2010 through October 2012). Using a weighted Pearson correlation coefficient, we assessed whether these changes were correlated.

RESULTS

INDEX HOSPITALIZATIONS

Our data set included 7,175,558 index stays for targeted conditions and 45,495,870 index stays for nontargeted conditions in 3387 hospitals, among patients discharged between October 1, 2007, and May 31, 2015. On average, hospitals had 24.7 (range, 1 to 321) stays per month for targeted conditions and 151.9 (range, 1 to 2268) stays per month for nontargeted conditions. A larger proportion of index stays for nontargeted conditions than for targeted conditions was observed in larger hospitals, in teaching hospitals, and in hospitals in urban areas. Patients hospitalized for targeted conditions were more likely than those hospitalized for nontargeted conditions to be older and to be men. Between 2007 and 2015, there was very little change in the characteristics of patients who were admitted for targeted or for nontargeted conditions or of the hospitals to which they were admitted.

READMISSIONS

From 2007 to 2015, risk-adjusted rates of readmission for targeted conditions declined from 21.5% to 17.8%, and rates for nontargeted conditions declined from 15.3% to 13.1% (Table 1). Trends in readmissions are shown in Figure 1 and Table 2. Monthly readmission rates for targeted conditions were already decreasing before passage of the ACA (slope of monthly rate, −0.017 [95% confidence interval {CI}, −0.022 to −0.012]), fell even more rapidly after implementation of the ACA (slope, −0.103 [95% CI, −0.107 to −0.098]), and then slowed during the long-term follow-up period to −0.005 (95% CI, −0.010 to −0.001). Readmission rates for nontargeted conditions were falling at a monthly rate of −0.008 (95% CI, −0.010 to −0.006) before passage of the ACA and then decreased significantly after its enactment (post-ACA slope, −0.061 [95% CI, −0.063 to −0.059]); however, the rates for nontargeted conditions were not decreasing as quickly as the rates for targeted conditions (difference between targeted and nontargeted slopes, −0.042 [95% CI, −0.046 to −0.037]). Finally, readmission rates for nontargeted conditions slowed to a slope of −0.004 (95% CI, −0.006 to −0.002) during the long-term follow-up period.

The change in slope between the pre-ACA

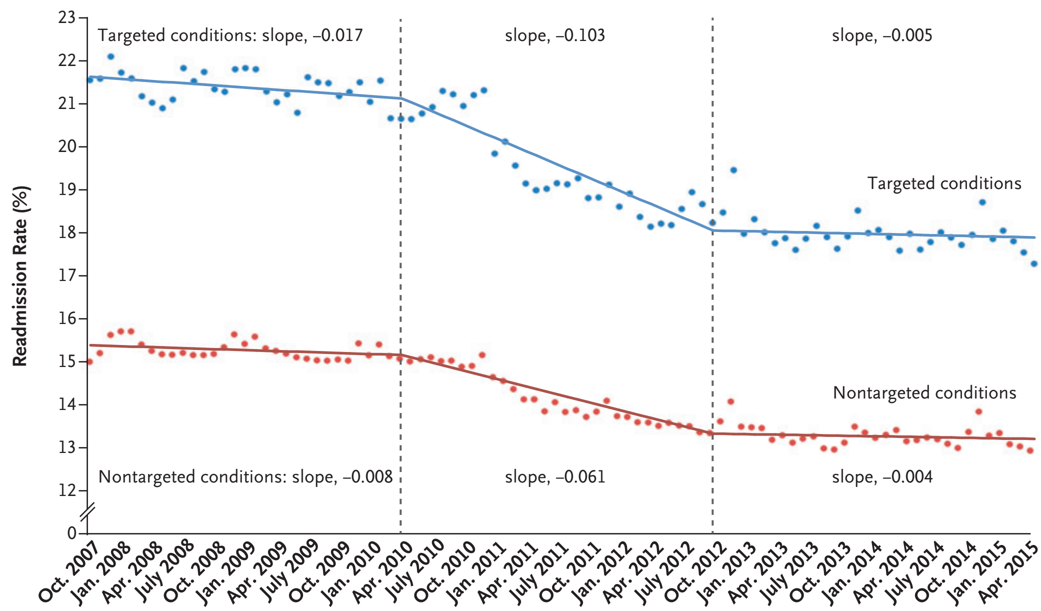

Figure 1. Change in Readmission Rates for Targeted Conditions and Nontargeted Conditions within 30 Days after Discharge.

Targeted conditions were acute myocardial infarction, heart failure, and pneumonia. Points represent the mean rate weighted by the number of hospital index stays during the month. Solid lines represent the predicted rates. Slopes are the monthly change in the predicted rates, generated from a linear combination of regression coefficients. Models are adjusted for seasonality with the use of an indicator for each 3-month season for targeted and nontargeted conditions; seasonal indicators are set equal to their means to generate a smooth predicted line. October 2007 through March 2010 was the period before enactment of the Affordable Care Act (ACA); April 2010 through September 2012 was the period of implementation of the Hospital Readmissions Reduction Program, which set financial penalties for hospitals that had higher-than-expected readmission rates for targeted conditions; and October 2012 through May 2015 was the long-term follow-up period after penalties were initiated. Dashed lines indicate divisions between periods.

period and the implementation period was significant for both types of conditions (targeted: −0.086 [95% CI, −0.094 to −0.078]; nontargeted: −0.054 [95% CI, −0.057 to −0.050]), as was the change in slope between the implementation period and the long-term follow-up period (targeted: 0.097 [95% CI, 0.090 to 0.105]; nontargeted: 0.057 [95% CI, 0.054 to 0.060]). The change in slope between the pre-ACA period and the implementation period differed significantly between the targeted and the nontargeted conditions (difference, −0.032; [95% CI, −0.041 to −0.024]), as did the change in slope between the implementation period and the long-term follow-up period (difference, 0.040 [95% CI, 0.033 to 0.048]), which implies that targeted conditions had a change in trajectory that was significantly larger than that of the nontargeted conditions at the passage of the ACA and again at the long-term follow-up period (Table 2).

The sensitivity analysis that included a 6-month initiation period after the passage of the ACA showed that readmission rates decreased most rapidly during the initiation period (Fig. S1 and Table S1 in the Supplementary Appendix), which implies that hospitals began reducing readmission rates shortly after the ACA was passed.

USE OF OBSERVATION SERVICES

From 2007 to 2015, rates of observation-service use for targeted conditions increased from 2.6% to 4.7%, and rates for nontargeted conditions increased from 2.5% to 4.2%. We observed consistent increases in observation-service use through-

Table 2. Rate of Change over Time in Readmission Rates and Observation-Service Use for Targeted and Nontargeted Conditions.*

Outcome and Time Period	Targeted Conditions	Nontargeted Conditions	Difference, Targeted–Nontargeted	Difference in Change, Targeted–Nontargeted
Readmissions				
Pre-ACA period — slope (95% CI)	−0.017 (−0.022 to −0.012)	−0.008 (−0.010 to −0.006)	−0.009 (−0.014 to −0.004)	
Implementation period				
Slope (95% CI)	−0.103 (−0.107 to −0.098)	−0.061 (−0.063 to −0.059)	−0.042 (−0.046 to −0.037)	
Change in slope from pre-ACA (95% CI)	−0.086 (−0.094 to −0.078)	−0.054 (−0.057 to −0.050)		−0.032 (−0.041 to −0.024)
Long-term follow-up period				
Slope (95% CI)	−0.005 (−0.010 to −0.001)	−0.004 (−0.006 to −0.002)	−0.001 (−0.006 to 0.003)	
Change in slope from implementation of ACA (95% CI)	0.097 (0.090 to 0.105)	0.057 (0.054 to 0.060)		0.040 (0.033 to 0.048)
Observation-service use				
Pre-ACA period — slope (95% CI)	0.020 (0.017 to 0.023)	0.021 (0.019 to 0.023)	−0.001 (−0.003 to 0.002)	
Implementation period				
Slope (95% CI)	0.025 (0.022 to 0.029)	0.021 (0.019 to 0.024)	0.004 (0.001 to 0.006)	
Change in slope from pre-ACA (95% CI)	0.005 (<0.000 to 0.011)	0.001 (−0.003 to 0.005)		0.005 (<0.000 to 0.009)
Long-term follow-up period				
Slope (95% CI)	0.033 (0.029 to 0.037)	0.023 (0.020 to 0.026)	0.010 (0.007 to 0.013)	
Change in slope from implementation of ACA (95% CI)	0.008 (0.001 to 0.014)	0.002 (−0.003 to 0.006)		0.006 (0.001 to 0.011)

* The pre-ACA period was from October 2007 through March 2010, the period of implementation of the ACA was from April 2010 through September 2012, and the long-term follow-up period was from October 2012 through May 2015.

out the analysis period (Fig. 2 and Table 2). Monthly observation-service use was rising significantly and similarly for both targeted and nontargeted conditions before enactment of the ACA, with monthly slopes of 0.020 (95% CI, 0.017 to 0.023) and 0.021 (95% CI, 0.019 to 0.023), respectively. There were no significant changes in slope at the passage of the ACA. Rates for targeted conditions rose faster during the long-term follow-up than during the implementation period, with a change in slope of 0.008 (95% CI, 0.001 to 0.014), whereas the monthly slope for nontargeted conditions did not change significantly between these study periods.

OTHER OUTCOMES

We evaluated the outcome of any return to the hospital — either readmission or observation — within 30 days after discharge as a measure of sensitivity (Fig. S2 and Table S2 in the Supplementary Appendix). We found that these rates decreased for both types of admissions during the implementation period, but more so for targeted than for nontargeted conditions — a finding similar to that for readmissions alone. Monthly slopes were slightly positive before enactment of the ACA for nontargeted conditions and in the long-term follow-up period for both targeted and nontargeted conditions.

Figure 3 shows the within-hospital relation-

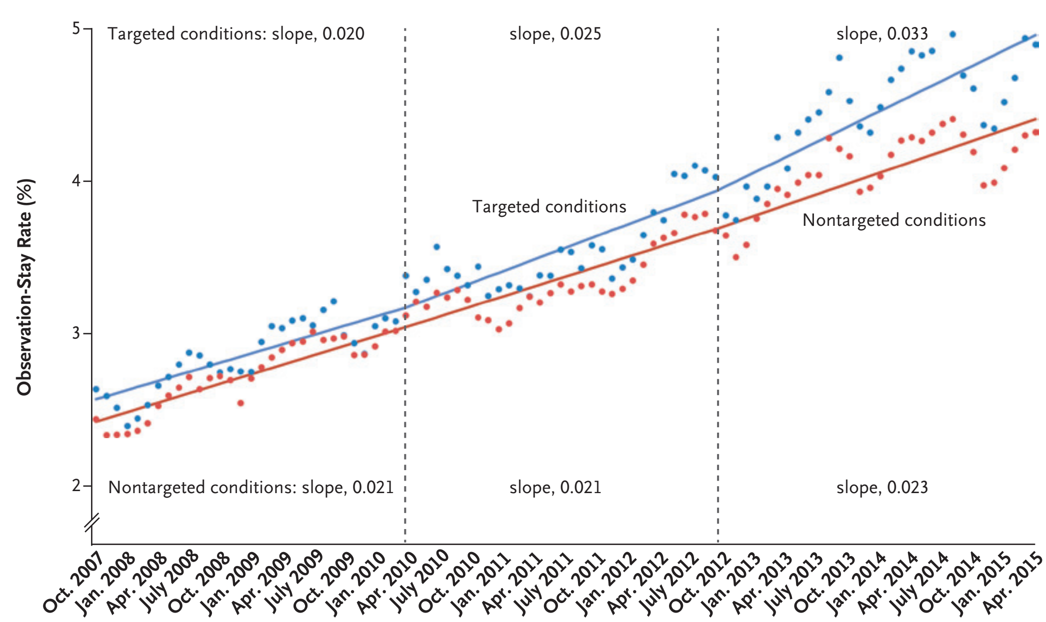

Figure 2. Change in Observation-Service Use for Targeted Conditions and Nontargeted Conditions within 30 Days after Discharge.

Points represent the mean rate weighted by the number of hospital index stays during the month. Solid lines represent the predicted rates. Slopes are the monthly change in the predicted rates, generated from a linear combination of regression coefficients. Models are adjusted for seasonality with the use of an indicator for each 3-month season for targeted and nontargeted conditions; seasonal indicators are set equal to their means to generate a smooth predicted line. October 2007 through March 2010 was the period before enactment of the ACA; April 2010 through September 2012 was the period of implementation of the Hospital Readmissions Reduction Program, which set financial penalties for hospitals that had higher-than-expected readmission rates for targeted conditions; and October 2012 through May 2015 was the long-term follow-up period after penalties were initiated. Dashed lines indicate divisions between periods.

ship between changes in observation-service use and readmissions for targeted conditions during the implementation period among 2936 hospitals with admissions in April 2010 and October 2012. There was no significant correlation between the change in readmission rate and the change in observation-service use (Pearson correlation coefficient, −0.03; P=0.07).

DISCUSSION

Our study has four key findings. First, readmission rates for both targeted and nontargeted conditions began to fall faster in April 2010, after the passage of the ACA, than before. Readmission rates continued to decline from October 2012 through May 2015, albeit at a slower rate. Second, the passage of the ACA was associated with a more substantial decline in readmissions beginning in April 2010 for targeted than for nontargeted conditions. Third, the rate of observation-service use for both types of conditions was increasing throughout the study periods. Finally, there was no significant association within hospitals between increases in observation-service use and reductions in readmissions during the implementation period.

The nonexperimental design of our study limits our ability to draw a firm causal link between the Hospital Readmissions Reduction Program and the outcomes of interest. Nonetheless, the interrupted time-series design allows us to draw credible implications about the associations between the program and rates of readmission and observation-service use. We think it is likely that hospitals responded at different times to

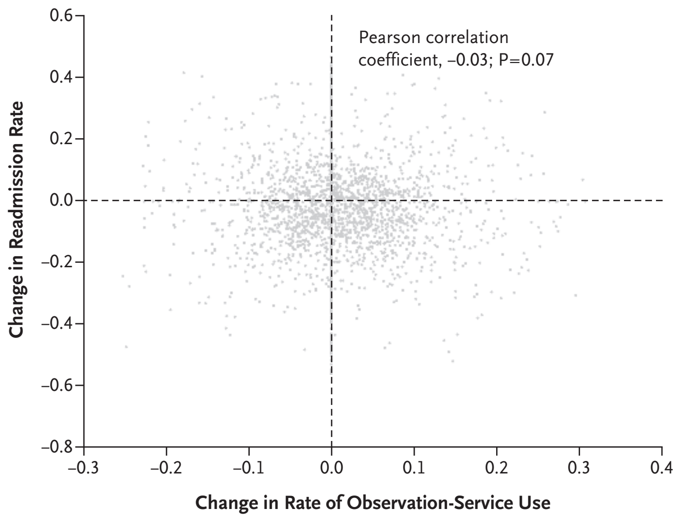

Figure 3. Relationship between Change in Readmission Rate and Change in Observation-Service Use.
Data are for readmissions and observation-service use for the targeted conditions within hospitals for the period after enactment of the ACA in April 2010 through September 2012.

the incentives from the program to reduce readmissions. There was national concern about readmissions well before enactment of the ACA. In its June 2007 and June 2008 Reports to Congress, the Medicare Payment Advisory Commission (MedPAC) explored changes in payment policy that were designed to reduce readmissions,[10,11] and Medicare began publicly releasing data on discharge planning and readmission rates well before 2010.[12] Thus, we think that it is plausible that passage of the ACA catalyzed behavioral change by many hospitals. In addition, other CMS efforts to reduce readmissions after the passage of the ACA could have aided hospitals during the implementation period.[13] For example, the CMS Partnership for Patients established the Hospital Engagement Networks in 2011 to identify and disseminate best practices, including efforts to reduce readmissions,[14] and hospital readmissions are outcomes in other Medicare quality programs besides the Hospital Readmissions Reduction Program.[15]

At the passage of the ACA, readmission rates for both targeted and nontargeted conditions fell, which implies that changes in the organization of care in response to the Hospital Readmissions Reduction Program, along with other factors noted above, may have had an effect beyond the targeted conditions. However, we still observed a greater change in rates of readmission for targeted conditions. Although this effect could be in response to the Hospital Readmissions Reduction Program, the higher baseline readmission rates for targeted conditions made it easier to reduce readmissions for these conditions than for the nontargeted conditions, which probably contributed to the greater decrease in readmission rates for targeted conditions. Some policymakers and MedPAC have proposed expanding the Hospital Readmissions Reduction Program to cover all clinical conditions.[16] This could create incentives for hospitals to more aggressively reduce readmissions for nontargeted conditions, more accurately highlight the intent of the program, and simplify the program by using a single readmission measure.

We found that readmission rates for both targeted and nontargeted conditions continued to fall during the long-term follow-up period but at a slower rate than during implementation. Presumably, hospitals made substantial changes during the implementation period but could not sustain such a high rate of reductions in the long term. The trends in observation-service use are less clearly associated with the passage of the ACA. We saw a steady increase in observation-unit stays during the entire analysis period, with no significant changes at the passage of the ACA. It seems likely that the upward trend in observation-service use may be attributable to factors that are largely unrelated to the Hospital Readmissions Reduction Program, such as confusion over whether an inpatient stay would be deemed inappropriate by Medicare recovery audit contractors.[17] Within hospitals, there was no significant association between changes in observation-service use and changes in readmission rates after implementation of the ACA. For this reason, our analysis does not support the hypothesis that increases in observation stays can account in any important way for the reduction in readmissions.

Our findings are consistent with previous research on trends in readmissions and observation-unit stays. Gerhardt et al. examined readmissions after all index stays and found a very modest decrease between 2007 and 2011 and a larger decrease in 2012. They also found an increase in observation-unit stays over time but concluded that the increases were too small to account appreciably for the decrease in readmissions.[4] The 2014 *Medicare Hospital Quality Chartbook* noted that there was a significant cross-sectional correlation between observation-unit stays and readmissions for targeted conditions, although the correlations were very small.[5] Carey and Lin found that readmission rates for targeted conditions fell faster than rates for other medical conditions in New York State between 2008 and 2012. They also found an increase in observation-unit stays.[3] We went beyond these cross-sectional analyses to evaluate whether hospitals that reduced their readmission rates after the ACA was passed were, at the same time, increasing their observation-service use.

Our study has limitations. Although our findings are consistent with hospitals changing their practices to reduce readmissions, we cannot be certain why we saw a reduction in readmissions after implementation of the ACA or why we saw another change in October 2012. Attribution of changes in readmissions to a specific time point is also confounded in any statistical analysis because of possible time lags between enactment of the program and any resulting change in the rate of readmissions. In our sensitivity analysis, we found that, on average, the change in trajectory in readmission rates seemed to happen quickly after the passage of the ACA. For observation-unit stays in particular, the presence of a dedicated observation unit may have affected trends in an individual hospital, but we could not evaluate such trends with our data.

In summary, we found a change in the rate of readmissions coincident with the enactment of the ACA, which suggested that the Hospital Readmissions Reduction Program may have had a broad effect on care, especially for targeted conditions. In the long-term follow-up period, readmission rates continued to fall for targeted and nontargeted conditions, but at a slower rate. We did not see large changes in the trends of observation-service use associated with the passage of the ACA, and hospitals with greater reductions in readmission rates were no more likely to increase their observation-service use than other hospitals. Given the change in patterns of care during the analysis period, it will be important to continue monitoring these trends.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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