

Hospital Participation in Meaningful Use and Racial Disparities in Readmissions

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Readmissions among Medicare beneficiaries are common and often reflect care of poor quality.¹ Racial minorities are more likely to be readmitted than other Medicare beneficiaries.² Policy makers have been optimistic that hospitals' adoption of health information technology (IT) will lead to lower readmission rates,³ and reducing health disparities is a priority of the federal Meaningful Use (MU) initiative.⁴ A recent study evaluated the impact of hospitals' participation in MU on readmission rates of Medicare fee-for-service (FFS) beneficiaries,⁵ but the relationship between hospitals' participation in the initiative and racial disparities in readmissions has not been examined.

The MU initiative was created through the Health Information Technology for Economic and Clinical Health (HITECH) Act. Approximately \$30 billion was made available through HITECH to promote the adoption and use of electronic health records (EHRs) certified by the Office of the National Coordinator for Health Information Technology.⁶⁻¹⁰ Hospitals have received MU incentive payments through the Medicare and Medicaid EHR Incentive Programs. For Stage 1 of the incentive programs, attestation requirements focused on capturing patients' clinical data electronically and making health information available to patients electronically¹¹ by requiring hospitals to meet 11 core objectives and 5 additional objectives selected from a menu of 10.¹² Hospitals were required to meet performance thresholds for the objectives and report their performance on them for 90 continuous days in order to receive incentive payments. Ongoing financial penalties imposed on hospitals that do not attest to MU requirements have further incentivized participation.

Hospitals have been responsive to the MU incentive payments and financial penalties, with 98% of eligible hospitals participating in the initiative as of 2016.¹³ MU participation among hospitals has not been associated with reductions in readmissions occurring within 30 days of discharge.⁵ However, given that racial minorities have higher readmission rates² and that reducing disparities is a priority of the MU initiative,⁴ it is possible that hospitals' participation in the initiative has had a greater impact on readmissions of racial minorities. The objective of this study was to measure the impact

ABSTRACT

OBJECTIVES: To measure the impact of hospital participation in Meaningful Use (MU) on disparities in 30-day readmissions associated with race.

STUDY DESIGN: A retrospective cohort study that compared the likelihood of 30-day readmission for Medicare beneficiaries discharged from hospitals participating in Stage 1 of MU with the likelihood of readmission for beneficiaries concurrently discharged from hospitals that were not participating in the initiative.

METHODS: Inpatient claims for 2,414,205 Medicare beneficiaries from Florida, New York, and Washington State were used as the primary data source. The study period (2009-2013) included at least 2 years of baseline data prior to each hospital initiating participation in MU. Estimates were derived with linear regression models that included hospital and time fixed effects. By including both hospital and time fixed effects, estimates were based on discharges from the same hospital in the same time period.

RESULTS: MU participation among hospitals was not associated with a statistically significant change in readmissions for the broader Medicare population (percentage points [PP], 0.6; 95% CI, -0.2 to 1.4), but hospitals' participation in the initiative was associated with a lower likelihood of readmission for African American beneficiaries (PP, -0.9; 95% CI, -1.5 to -0.4).

CONCLUSIONS: Hospital participation in MU reduced disparities in 30-day readmissions for African American Medicare beneficiaries.

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of hospital participation in MU on disparities in 30-day readmissions associated with race.

TAKEAWAY POINTS

- ▶ Hospital participation in Meaningful Use (MU) was not associated with declines in 30-day readmissions for the broader Medicare population.
- ▶ Hospital participation in MU was associated with a decline in readmissions of 0.9 percentage points for African American Medicare beneficiaries.

METHODS

Overview of the Research Design

The likelihood of 30-day readmission for Medicare beneficiaries discharged from hospitals participating in MU was compared with the likelihood of readmission for concurrent beneficiaries discharged from hospitals that were not participating in the initiative. The study period covered 2009 through 2013. Hospitals in our sample initiated MU participation at different times following the implementation of the initiative in 2011. The differential timing of hospitals' participation in MU was used to estimate its impact on readmissions.

It is possible that hospitals that were early participants in MU differed from later participants and nonparticipants in ways that affected the likelihood of readmission. Two steps were taken to address this issue. First, regression models included hospital fixed effects to control for permanent differences among hospitals. Second, only hospitals that began MU participation by the end of the study period were included in the sample.

Data Sources and Study Population

The primary data sources for the study were State Inpatient Databases for Florida, New York, and Washington State from the Healthcare Cost and Utilization Program (HCUP) within the Agency for Healthcare Research and Quality. HCUP State Inpatient Databases include all discharges, regardless of payer, from community hospitals in a given state. The American Hospital Association Annual Survey provided information on hospitals' use of EHRs, and Stage 1 MU payment records from the Medicare and Medicaid EHR Incentive Programs were used to identify participants. The unit of analysis was the hospitalization. Therefore, some patients were observed multiple times over the study period.

The study sample included 2,414,205 unique Medicare beneficiaries 65 years and older, in both FFS and Medicare Advantage, who were discharged to home or postacute care from 291 nonfederal hospitals. The MU incentive programs were implemented in 2011. Therefore, the study period (2009-2013) included at least 2 years of baseline data before each hospital began MU participation.

Variables

The outcome was an indicator of all-cause 30-day readmission derived from the HCUP algorithm for hospital revisits.¹⁴ Patient identifiers in the State Inpatient Databases only allowed a readmission to be identified if it took place in the same state as the index admission. For Washington, patient identifiers were not consistent from year to year and, therefore, index admissions occurring in

December were excluded for this state. Control variables included indicators for age (65-69, 70-74, 75-79, 80-84, 85 years and older), gender, race, quartiles of median household income for the patient's zip code, Deyo-Charlson Comorbidity Index scores (1, 2, 3, 4, 5 or higher),¹⁵ weekend admission, and a continuous measure of length of stay.¹⁶ Race categories for white and African American beneficiaries have shown reasonable reliability in administrative claims, but other race and ethnicity categories are less reliable.¹⁷⁻¹⁹ Therefore, race was categorized as white, African American, and other nonwhite race. Additionally, a binary indicator for hospital participation in MU was included in the model. Once a hospital received a Stage 1 payment from either the Medicare or Medicaid EHR incentive program, the measure identified the hospital as a MU participant from that year forward through the rest of the study period. The initial Stage 1 incentive payment was made to a hospital up to 8 weeks after it completed the 90-day attestation period.²⁰ Therefore, each hospital had been meeting MU objectives for up to 5 months when the initial Stage 1 payment was received. The determinants of interest were interaction terms for a hospital's participation in MU and patient race categories. Estimates associated with the interaction terms indicated whether hospital MU participation differentially impacted the likelihood of readmission for racial minorities.

Statistical Analysis

Linear probability models with hospital and year fixed effects were used for estimation. This approach controls for permanent differences among hospitals by including a dummy variable for each. By including both hospital and time fixed effects, estimates were based on discharges from the same hospital in the same time period. However, the inclusion of fixed effects in the regression model results in wider confidence intervals for the estimated coefficients.

In a secondary analysis, an indicator for EHR use in the year prior to MU participation was added to the specification. This was done to examine whether any changes in the likelihood of readmission were due to hospitals' MU participation or simply use of an EHR. The standard errors were adjusted for clustering at the level of the hospital in both models.²¹ SAS version 9.2 (SAS Institute; Cary, North Carolina) and Stata MP version 14 (StataCorp; College Station, Texas) were used for analyses.

The study was approved by the Human Protections Office of Weill Cornell Medical College.

TABLE 1. Characteristics of Medicare Beneficiaries, Hospital Discharges, and Hospitals^a

Characteristics of Beneficiaries (N = 2,414,205)	
Age, years (mean [SD])	78.2 (8.4)
Female (%)	56.6
Race (%)	
White	77.2
African American	8.4
Other nonwhite race	12.9
Unknown race	1.4
Median household income for zip code (%)	
Quartile 1 (lowest)	23.0
Quartile 2	26.0
Quartile 3	26.0
Quartile 4 (highest)	25.0
Characteristics of Hospital Discharges (N = 4,958,871)	
Deyo-Charlson Comorbidity Index score (mean [SD])	2.3 (2.2)
Length of stay, days (mean [SD])	5.4 (5.2)
Weekend admission (%)	19.9
Characteristics of Hospitals (N = 291)	
Total licensed beds (mean [SD])	341.2 (312.6)
Not-for-profit (%)	71.9
For-profit (%)	4.3
Government (%)	23.8
Medical school affiliation (%)	39.5
EHR, no MU participation in 2011 (%)	39.6
EHR, no MU participation in 2012 (%)	7.1
MU participation in 2011 (%)	33.5
MU participation in 2012 (%)	92.4

EHR indicates electronic health record; MU, Meaningful Use.

^aMany beneficiaries had more than 1 hospitalization. The most recent observation was used for beneficiary characteristics. Unless otherwise noted, hospital characteristics are from 2012.

TABLE 2. Unadjusted 30-Day Readmission Rates for Medicare Beneficiaries for Each Year of the Study Period (2009-2013)

	2009	2010	2011	2012	2013
All Medicare beneficiaries	20.6	21.1	21.1	20.6	19.6
White	20.0	20.6	20.7	20.0	19.2
African American	24.3	24.3	23.8	23.6	22.1
Other nonwhite race	21.9	22.3	21.8	22.0	20.2

RESULTS

Sample Characteristics

The mean age of Medicare beneficiaries in our sample was 78.2 years, and 56.6% were female (Table 1). The racial composition of the sample was 77.2% white, 8.4% African American, and 12.9% other

nonwhite race; 1.4% of the sample was of unknown race. Slightly more beneficiaries resided in middle-income zip codes than low- or high-income zip codes, with 22% in the lowest quartile, 26% each in the second and third quartiles, and 25% in the highest quartile. For hospital discharges, the mean score on the Deyo-Charlson index was 2.3, mean length of stay was 5.4 days, and 19.9% were weekend admissions. Among the hospitals in our sample, the mean number of licensed beds was 341.2, the majority (71.9%) were not-for-profit, 23.8% were government hospitals, and 39.5% were affiliated with a medical school. In 2011, the first year of the Medicare and Medicaid EHR Incentive Programs, 39.6% of the hospitals in our sample had an EHR but did not participate in MU and 33.5% initiated participation in the initiative. In 2012, the proportion of hospitals with EHRs and no MU participation fell to 7.1% and the proportion of hospitals participating in the initiative grew to 92.4%.

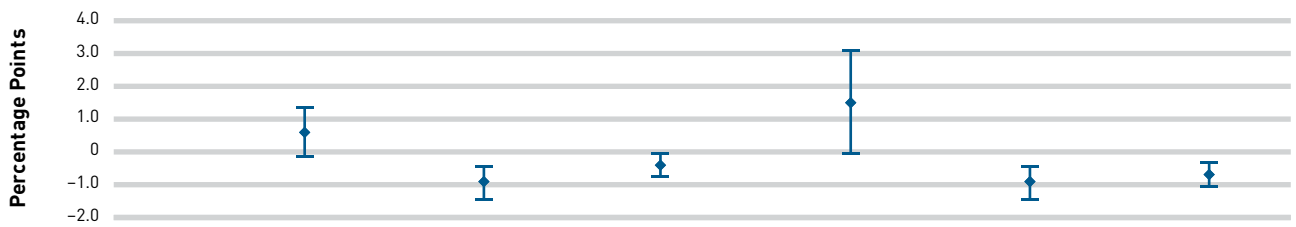
Unadjusted Readmission Rates

Unadjusted 30-day readmission rates for all Medicare beneficiaries rose in the first 2 years of the study period (Table 2), climbing from 20.6% in 2009 to 21.1% in 2011, when the MU initiative was first implemented. Readmission rates then declined to 19.6% in 2013, the last year of the study period. A similar trend in unadjusted 30-day readmissions was observed for white beneficiaries, although the annual rates were lower in magnitude than rates for all Medicare beneficiaries in each year of the study period. For African American beneficiaries, readmission rates were higher throughout the study period compared with the rates for all beneficiaries. However, after remaining at 24.3% in 2009 and 2010, the readmission rate for African American beneficiaries fell to 23.8% in 2011 and 22.1% in 2013. Unadjusted readmission rates for beneficiaries who were not white or African American followed the same trend as those for all Medicare beneficiaries, but were higher in each year.

Regression Estimates

Regression estimates (Figure) did not indicate reductions in readmissions associated with hospital participation in MU for the overall Medicare population in our sample (percentage points [PP], 0.6; 95% CI, -0.2 to 1.4). The estimate for the interaction between MU participation and African American race (PP, -0.9; 95% CI, -1.5 to -0.4) indicated statistically significant declines in readmissions compared with white beneficiaries, but the interaction of MU participation and other nonwhite race did not indicate a reduction in these events compared with white beneficiaries (PP, -0.4; 95% CI, -0.8 to 0.0). The decline of 0.9 PP represents a 3.7% relative decrease in readmissions for African American beneficiaries using the unadjusted rate prior to MU (24.3%) as the baseline. Similar to our primary analysis, results from our secondary analysis that controlled for prior EHR use did not suggest a relationship between hospitals' participation in the initiative and readmissions among the broader Medicare population (PP, 1.5; 95% CI, -0.1 to 3.1), but

FIGURE. Regression Estimates of the Relationship Between Hospitals' Participation in MU and 30-Day Readmissions of Medicare Beneficiaries^a



Percentage Point Difference	Estimates for Primary Analysis			Estimates for Secondary Analysis		
	MU Participation	MU × African American Race	MU × Other Nonwhite Race	MU Participation	MU × African American Race	MU × Other Nonwhite Race
◆ Point Estimate	0.6	-0.9	-0.4	1.5	-0.9	-0.7
— Lower CI	-0.2	-1.5	-0.8	-0.1	-1.5	-1.1
— Upper CI	1.4	-0.4	0.0	3.1	-0.4	-0.3

MU indicates Meaningful Use.

^aRegression models controlled for age, gender, race, median household income for the patient's zip code, Deyo-Charlson Comorbidity Index scores, length of stay, and weekend admission. The regression model for the secondary analysis also controlled for electronic health record use in the year prior to MU participation. Both models included hospital and year fixed effects. Estimates are shown with 95% CIs.

indicated a decline in the likelihood of readmission among African American beneficiaries (PP, -0.9; 95% CI, -1.5 to -0.4). Additionally, a statistically significant decline in readmissions for beneficiaries of other nonwhite race was associated with hospitals' participation in MU in the secondary analysis (PP, -0.7; 95% CI, -1.1 to -0.3).

DISCUSSION

Hospital participation in MU was not associated with a reduced likelihood of readmission for the overall Medicare population in our sample, but it was associated with reductions in these events for African American beneficiaries. The results of a secondary analysis that controlled for use of an EHR prior to a hospital's MU participation were consistent with these findings.

Our study represents an important addition to the existing literature because, despite the nation's \$30-billion investment in health IT through the MU initiative,⁴ evaluations of provider participation have shown little evidence of improvements in the quality of care.^{5,22-24} It is important to note that previous studies of provider participation in MU, including this one, have only examined Stage 1 of the initiative. Use of more advanced functions, such as interoperability of EHRs, in addition to improving patient outcomes were not emphasized until later stages of the initiative. However, better documentation of patients' clinical information and improved access to that information through Stage 1 attestation requirements may have affected patients at higher risk of readmission,²⁵ including racial minorities, more than other patients. Additionally, MU participation may have led

to reductions in readmissions among broader groups of patients after the study period as hospitals gained more experience with EHRs, including increased use of health information exchange, and learned to use these systems to improve patient outcomes.

Limitations

Our study has limitations to consider. Due to our reliance on administrative claims, it is possible that unobserved differences among hospitals influenced our results. Our inclusion of hospital fixed effects and limiting the sample to hospitals that initiated participation in MU prior to the end of the study period mitigated the potential for bias, but we cannot rule out this possibility. For example, these approaches would not have controlled for unobserved differences among hospitals or patients that changed over time. Additionally, records for incentive payments were used to identify the timing of MU participation, which likely introduced some measurement error. This would introduce bias toward the null leading to estimates that understated the impact of hospitals' MU participation on readmissions. Differential 30-day mortality rates may also have influenced estimates of readmission. With the HCUP State Inpatient Databases, it was not possible to identify beneficiaries who died after hospital discharge. Although 30-day mortality is a competing risk, previous studies of Medicare readmissions have not shown mortality rates to be a considerable influence on estimates of hospitalization rates, including readmissions.^{16,26} We also included only 3 race categories: white, African American, and other nonwhite race. Combining multiple groups into "other nonwhite race" could have masked differences among these groups and introduced measurement error,

biasing the estimate toward no effect. It was also not possible to determine whether a patient's primary care physician was notified of a hospitalization or if the physician had an interoperable EHR that was capable of receiving the patient's information electronically from the hospital. Timely follow-up care after hospital discharge and better coordinated care enabled through the electronic exchange of a patient's health information could reduce the likelihood of readmission. However, findings of a previous study indicated that physician participation in MU did not lower the likelihood of 30-day readmissions for Medicare beneficiaries.²³ Lastly, our sample only included hospitalized Medicare beneficiaries from Florida, New York, and Washington. However, these states are located in different regions of the country and have diverse populations.

In addition to the limitations listed above, other policy initiatives that may have been implemented during the study period with the goal of reducing readmissions may have affected our estimates. These include Medicare's Hospital Readmissions Reduction Program (HRRP) and the Medicare Shared Savings Program (MSSP) for accountable care organizations (ACOs). Hospitals could also potentially have used EHRs adopted through MU participation to improve their performance in these initiatives. The HRRP was implemented in October 2012 and the first MSSP ACOs began in April 2012. If early participants in MU were more likely to participate in these programs, which led to more resources being focused on patients with a higher likelihood of readmission, such as racial minorities, our estimates may overstate the impact of hospitals' participation in MU.

CONCLUSIONS

To our knowledge, this is the first study of the relationship between hospital participation in MU and racial disparities in readmissions. We found a statistically significant relationship between hospitals' participation in the initiative and reductions in racial disparities associated with 30-day readmissions among Medicare beneficiaries. Additional study is needed to determine if disparities were further reduced as hospitals gained more experience with EHRs and outcomes were emphasized in later stages of MU. ■

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