

Comparison of Mortality Between Medicare Advantage and Traditional Medicare Beneficiaries With Kidney Failure

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Over the past 15 years, enrollment in Medicare Advantage (MA) has quadrupled from 5.6 million in 2005 to 24.1 million in 2020, or 36% of all Medicare beneficiaries.¹ Unlike traditional Medicare (TM), MA plans—private managed care plans—receive capitated payments to bear the risk of paying for covered services for their enrollees.²⁻⁴ In addition, MA plans receive bonus payments on the basis of a composite measure of quality, which includes kidney disease monitoring.⁵ The capitated and value-based payments may incentivize MA plans to improve quality of care while reducing costs, and therefore the health outcomes of MA enrollees could be better than those of TM enrollees.^{6,7} In contrast, if the plans' cost-containment efforts restrict access to effective care, the health outcomes of MA enrollees may be compromised. Previous studies on the effects of MA on health outcomes have shown mixed results, and few studies have focused on outcomes for individuals with complex health conditions such as kidney failure.⁸⁻¹⁷

The comparison of health outcomes between MA and TM enrollees is empirically challenging because of favorable selection bias arising from MA plans attracting healthier and less-costly individuals to enroll.¹⁸⁻²³ In order to address the favorable selection by adjusting for underlying health status of MA and TM enrollees, many studies have attempted to use claims data that contain information on enrollees' clinical diagnoses.^{12,19-21} However, claims data for MA enrollees are often unavailable; most previous studies have compared MA enrollees who switched from TM (TM-to-MA switchers) with those who remained in TM (TM stayers) because the claims data for the TM-to-MA switchers are available for the period prior to the switch to MA.¹⁹⁻²¹ It is important to note that the comparison between TM-to-MA switchers and TM stayers is more prone to favorable selection bias than the comparison between MA stayers and TM stayers if TM-to-MA switchers are healthier than MA stayers.

Comparisons of mortality rates for MA and TM are of particular interest for high-cost, high-need patients with severe chronic illnesses, given that MA plans' quality-enhancing strategies (eg, chronic care management) may disproportionately benefit those with serious chronic conditions.²⁴ Further, plans' cost-containment strategies, such as restricted networks, may have adverse consequences for

ABSTRACT

OBJECTIVES: To compare risk-adjusted 1-year mortality between Medicare Advantage (MA) and traditional Medicare (TM) enrollees with kidney failure who initiated dialysis.

STUDY DESIGN: Longitudinal analysis of mortality and enrollment data for Medicare beneficiaries.

METHODS: The study compared mortality between MA and TM enrollees with kidney failure who initiated dialysis in 2016, accounting for their enrollment switches between MA and TM during 12 months prior to dialysis initiation. Analyses were adjusted for risk scores and fixed effects for the month of dialysis initiation and county of residence.

RESULTS: The difference in risk-adjusted 1-year mortality between MA stayers (Medicare beneficiaries who were continuously enrolled in MA prior to dialysis initiation) and TM stayers (those who were continuously enrolled in TM prior to initiating dialysis) was -0.1 percentage points (95% CI, -1.0 to 0.8); however, the difference increased to -1.0 percentage points (95% CI, -3.2 to 1.2) when comparing TM-to-MA switchers (those who switched from TM to MA before initiation) with TM stayers, a comparison more prone to favorable selection bias given our finding that TM-to-MA switchers were healthier than MA stayers.

CONCLUSIONS: Among Medicare beneficiaries with kidney failure who initiated dialysis, risk-adjusted 1-year mortality rate is not different between MA and TM stayers. If there is remaining favorable selection in MA due to unobserved health status, our finding provides a lower-bound estimate of the MA impact on mortality among beneficiaries with kidney failure.

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high-need, high-cost patients. In this study, we compared 1-year mortality between MA and TM enrollees with kidney failure who initiated dialysis. We adjusted for differences in their health status and accounted for their enrollment switches in and out of MA plans prior to dialysis initiation. Specifically, we compared risk-adjusted 1-year mortality between MA stayers and TM stayers, adjusting for their underlying health status based on MA encounter data containing all claims of MA enrollees as well as TM claims data.

METHODS

Study Design

This longitudinal cohort study compared 1-year mortality between MA and TM enrollees with kidney failure initiating dialysis who lived in the same county. Those enrollees who received a kidney transplant after dialysis initiation were included. We particularly focused on the comparison between MA and TM enrollees who were continuously enrolled in MA or in TM during the 12 months prior to dialysis initiation (MA stayers and TM stayers). This comparison is preferable to the comparison between those who switch to MA prior to initiating dialysis (TM-to-MA switchers) and TM stayers because the latter comparison is more susceptible to favorable selection bias if TM-to-MA switchers are systematically healthier than MA stayers (eAppendix Figure 1 [eAppendix available at ajmc.com]). Note that in the 2 comparisons—(1) MA stayers vs TM stayers and (2) TM-to-MA switchers vs TM stayers—TM stayers are the common reference group, hence the main contrast is the difference between MA stayers and TM-to-MA switchers in favorable selection.

We also compared predialysis nephrology care and the use of an arteriovenous fistula or graft for dialysis among MA and TM enrollees. Given evidence that predialysis nephrology care is an important determinant of postdialysis outcomes, mortality following dialysis initiation should be attributed to the insurance program (MA or TM) in which the beneficiary was enrolled during the 12 months prior to starting dialysis. Further, the measures of predialysis nephrology care and fistula or graft placement in those starting dialysis occur in the year prior to initiation. Therefore, these measures should account for the enrollment status in MA or TM prior to dialysis initiation.

Data Sources and Study Population

The primary data sources were the CMS ESRD [end-stage renal disease] Medical Evidence Report (CMS form No. 2728) and the ESRD Death Notification Form (CMS form No. 2746), as well as MA encounter data, TM claims, and the Master Beneficiary Summary File (MBSF). The Medical Evidence Report provides detailed clinical information (eg, comorbid conditions, serum albumin and hemoglobin levels) for all patients with kidney failure. It was documented that

TAKEAWAY POINTS

The comparison of mortality between Medicare Advantage (MA) and traditional Medicare (TM) enrollees is empirically challenging because of favorable selection bias arising from MA plans attracting healthier individuals to enroll.

- ▶ Comparison of mortality between MA and TM “stayers,” which is less prone to favorable selection bias, indicated no difference in mortality among beneficiaries with kidney failure.
- ▶ Our finding provides a lower-bound estimate of the MA impact on mortality if there is remaining favorable selection in MA due to unobserved health status.
- ▶ It is important to account for enrollment switches between MA and TM when comparing health outcomes between MA and TM enrollees.

comorbid conditions on this form were underreported^{25,26}; however, the percentage of patients who reported any comorbid condition other than their primary cause of kidney failure was similar between MA and TM enrollees (74.6% vs 73.0%), suggesting no differential underreporting between the 2 groups. The Death Notification Form includes information on date and cause of death reported by the treating nephrologist within 14 days of death for all patients who survive until the 91st day after dialysis initiation. MA encounter data contain claims (inpatient, outpatient, and carrier claims) for all MA enrollees. The MBSF provides monthly indicators of MA or TM enrollment status, as well as other demographic characteristics. We merged the CMS ESRD Medical Evidence Report with the MBSF to identify MA and TM status of beneficiaries with kidney failure who initiated dialysis in 2016 during 12 months prior to and at the time of their dialysis initiation. To calculate risk scores based on comorbidities during the year prior to dialysis initiation, we used the 2015 MA encounter data and TM claim files for MA and TM enrollees, respectively.

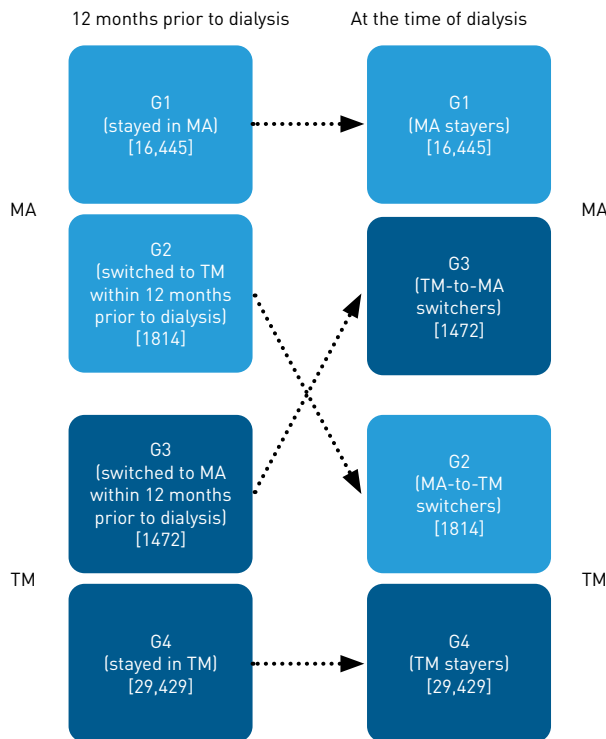
The study population included 49,160 Medicare beneficiaries (17,917 MA enrollees and 31,243 TM enrollees) 67 years and older who initiated dialysis in 2016 with continuous Medicare coverage from 1 year prior to dialysis initiation (eAppendix Figure 2).

Measures

The primary outcome was risk-adjusted 1-year mortality conditional on survival up to the 91st day following the initiation of dialysis. The US Renal Data System and previous studies have used this approach because death records for incident patients in the Death Notification Form are not reliably reported within the first 90 days following dialysis initiation.²⁷⁻³⁰ The secondary outcomes were predialysis nephrology care and the use of an arteriovenous fistula or graft during the first dialysis treatment.

The primary explanatory variable of interest was an indicator for enrollment in MA at the time of dialysis initiation without changing MA enrollment status during 12 months prior to the dialysis initiation. Covariates included beneficiaries' age, sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or other), dual eligibility for Medicare and Medicaid, primary cause of kidney failure (diabetes, hypertension, or other), comorbid conditions, tobacco use, alcohol and drug dependence, hemoglobin and serum

FIGURE 1. Classification of MA and TM Stayers and Switchers in the 12 Months Prior to Initiation of Dialysis^a



G, group; MA, Medicare Advantage; TM, traditional Medicare.

^aData include Medicare patients with end-stage renal disease 67 years and older who initiated dialysis in 2016. Numbers of incident patients are in brackets.

albumin levels, body mass index (BMI), risk scores, and proportion of individuals 65 years and older living in the beneficiary's zip code with income below the federal poverty level and with educational attainment of a high school degree or higher. The risk scores were calculated following the CMS–Hierarchical Condition Categories ESRD algorithm.³¹ The zip code–level characteristics were obtained from the 2012–2016 American Community Survey.

Statistical Analysis

We used multivariable linear regression models adjusting for beneficiaries' sociodemographic and clinical characteristics as well as risk scores to account for potential differences in underlying health status between MA and TM enrollees with kidney failure. All models included fixed effects for the month of dialysis initiation and county of residence. Heteroskedasticity-robust standard errors were clustered at the county level to allow for unrestricted serial correlation within a county. For observations with missing values on covariates (ie, BMI, hemoglobin and albumin levels), we imputed using the mean value of the nonmissing observations on the covariates. The primary variable of interest was an indicator for being an MA stayer at the time of dialysis initiation, with a reference group of

TM stayers, which yielded the difference in outcomes between MA and TM stayers. We also compared outcomes between TM-to-MA switchers and TM stayers as done in most previous studies.

Sensitivity Analysis

In sensitivity analyses, we explored whether the composition of patients who initiated dialysis differed between MA and TM enrollees (eg, MA plans delayed dialysis initiation among low-risk patients) by comparing their estimated glomerular filtration rate,³² a measure of kidney function, at dialysis initiation. In addition, we conducted the main analysis by quartile of risk score to explore whether a mortality difference, if any, between MA and TM stayers varied across underlying health status. We also compared all MA enrollees (MA stayers and TM-to-MA switchers) and all TM enrollees (TM stayers and MA-to-TM switchers). Further, we applied a logit specification to the main regression model to account for the binary outcome—whether an enrollee died within a year since the 91st day following dialysis initiation.

RESULTS

Figure 1 shows MA and TM enrollment status of the study population during 12 months prior to and at the time of dialysis initiation, respectively. A total of 49,160 Medicare beneficiaries 67 years and older who initiated dialysis in 2016 included 16,445 (33.5%) MA stayers and 29,429 (59.9%) TM stayers at the time of dialysis initiation and 1472 (3.0%) TM-to-MA switchers and 1814 (3.7%) MA-to-TM switchers during 12 months prior to the dialysis initiation. The characteristics of enrollees in each group by MA-TM enrollment status are presented in **Table 1**. Compared with TM stayers, MA stayers were more likely to be Black (25.0% vs 18.6%) and dually eligible for Medicaid (25.4% vs 22.3%). Also, MA stayers tended to have fewer comorbid conditions and lower risk scores than TM stayers. Furthermore, TM-to-MA switchers were less likely to have cardiac-related comorbid conditions (congestive heart failure, atherosclerotic heart disease, and other cardiac disease) and had lower median risk scores than MA stayers, implying that TM-to-MA switchers were healthier than MA stayers based on these observable characteristics.

Difference in Mortality

The unadjusted 1-year mortality rate of MA stayers was lower than that of TM stayers, with a difference of 2.42 (95% CI, 1.62–3.23) percentage points (**Table 2**). The mortality gap was larger between TM-to-MA switchers and TM stayers, with a 5.23-percentage-point difference (95% CI, 3.18–7.28). The adjusted mortality difference between MA stayers and TM stayers was –0.11 (95% CI, –1.01 to 0.78) percentage points; however, the difference increased to –1.0 (95% CI, –3.22 to 1.21) percentage points when comparing TM-to-MA switchers with TM stayers. Of note, the top 10 leading causes of death were similar for all 4 groups (ie, MA stayers, TM-to-MA switchers, MA-to-TM switchers, and TM stayers) (**eAppendix Table 1**).

Figure 2 plots 1-year mortality rates by risk score for MA and TM stayers. The unadjusted mortality rate of MA stayers was lower than that of TM stayers over almost the whole range of risk scores (panel A). However, once adjusted for patient sociodemographic and clinical characteristics with county fixed effects, the mortality rate of MA stayers was close to that of TM stayers whose risk scores were relatively low (<1.0); and the mortality of MA stayers was even higher than that of TM stayers for those with higher risk scores (≥ 1.0) (panel B).

Differences in Predialysis Nephrology Care and Vascular Access for Dialysis

In adjusted analyses, there was no significant difference in predialysis nephrology care (0.32 percentage points; 95% CI, -0.89 to 1.54) or dialysis initiation with arteriovenous fistula or graft present (0.07 percentage points; 95% CI, -1.31 to 1.45) between MA and TM stayers, whereas the differences between TM-to-MA switchers and TM stayers were -3.57 (95% CI, -6.25 to -0.89) percentage points and -3.90 (95% CI, -6.58 to -1.22) percentage points, respectively.

Sensitivity Analysis

In adjusted analysis for the estimated glomerular filtration rate (Table 1), we found no significant difference between MA and TM stayers, implying a comparable patient composition between the 2 groups.

The analyses by quartile of risk score (eAppendix Table 2) showed no difference at the 5% significance level in mortality rates between MA and TM stayers across quartiles of risk scores. A similar result was observed for predialysis nephrology care: The difference was not significant except for the second quartile of risk scores (2.26 percentage points; 95% CI, 0.07-4.45). The use of arteriovenous fistula or graft exhibited no significant difference except for the first quartile of risk scores (4.42 percentage points; 95% CI, 1.78-7.05).

The comparison between all MA enrollees (TM-to-MA switchers and MA stayers) and all TM enrollees (MA-to-TM switchers and TM stayers) yielded consistent results with the comparison between MA and TM stayers: In adjusted analyses, there were no significant differences in mortality, predialysis nephrology care, and the use of arteriovenous fistula or graft (eAppendix Table 3). Results were also consistent in analyses that applied a logit model instead of a linear probability model (eAppendix Table 4).

TABLE 1. Characteristics of Medicare Enrollees With Kidney Failure, by Enrollment Status at the Time of Dialysis Initiation*

Characteristic	MA		TM	
	Stayers	Switchers (TM-to-MA)	Switchers (MA-to-TM)	Stayers
	G1	G3	G2	G4
Number of beneficiaries	16,445	1472	1814	29,429
Age in years, mean	75.84	74.03	75.91	76.20
Female, %	44.31	45.24	51.49	43.01
White, non-Hispanic, %	52.81	38.52	45.81	66.70
Black, non-Hispanic, %	25.01	32.47	26.41	18.58
Hispanic, %	15.32	20.72	18.58	8.56
Dual eligibility for Medicaid, %				
Fully eligible	16.66	30.10	47.63	17.21
Partially eligible	8.74	9.58	6.62	5.13
Primary cause of kidney failure, %				
Diabetes	48.21	51.63	50.22	44.89
Hypertension/large vessel disease	34.24	31.79	33.74	34.74
Other or uncertain	17.55	16.58	16.04	20.36
Comorbid conditions, %				
Congestive heart failure	34.62	33.22	39.97	36.55
Atherosclerotic heart disease	18.38	16.17	17.03	19.31
Other cardiac disease	25.83	24.05	26.46	27.73
Hypertension	88.57	89.67	88.81	87.95
Diabetes	59.76	64.06	63.18	56.90
Chronic obstructive pulmonary disease	11.94	12.43	13.89	13.50
Cancer	9.67	7.68	8.32	11.24
Current smoker, %	4.09	4.42	3.36	3.86
Alcohol dependence, %	0.69	0.75	0.99	0.76
Drug dependence, %	0.20	0.41	0.11	0.18
Hemoglobin, g/dL	9.36	9.28	9.28	9.40
Serum albumin, g/dL	3.20	3.16	3.16	3.18
Obese (BMI > 30), %	35.07	33.70	34.34	35.17
Risk score, mean	0.91	0.91	0.90	0.93
Median risk score	0.84	0.83	0.80	0.85
Kidney transplant rate, %	0.63	0.45	0.68	0.77
Zip code-level characteristics, aged ≥ 65 years, %				
Below poverty	11.34	12.46	13.00	10.13
High school graduate or more	77.43	74.76	74.65	79.87

BMI, body mass index; G, group; MA, Medicare Advantage; TM, traditional Medicare.

*Data include Medicare patients with end-stage renal disease 67 years and older who initiated dialysis in 2016. Each group (G1 to G4) corresponds to the groups depicted in Figure 1. The kidney transplant rates are calculated for a 1-year period conditional on survival on the 91st day following the dialysis initiation.

DISCUSSION

After adjusting for sociodemographic characteristics and underlying health status based on risk scores and other clinical characteristics, we found no statistically significant difference in 1-year mortality between MA and TM stayers with kidney failure. Similarly, the comparison between TM-to-MA switchers and TM stayers also

TABLE 2. Difference in Nephrology Care and Mortality Between MA and TM Enrollees*

Nephrology care and mortality	MA		TM		Unadjusted difference (95% CI)		Adjusted difference (95% CI)	
	Stayers	TM-to-MA switchers	MA-to-TM switchers	Stayers	TM-to-MA switchers vs TM stayers	MA stayers vs TM stayers	TM-to-MA switchers vs TM stayers	MA stayers vs TM stayers
	G1	G3	G2	G4	G3 vs G4	G1 vs G4	G3 vs G4	G1 vs G4
Nephrology care prior to dialysis	79.66	73.98	74.37	79.03	-5.05*** [-7.61 to -2.50]	0.63 [-0.21 to 1.46]	-3.57*** [-6.25 to -0.89]	0.32 [-0.89 to 1.54]
Arteriovenous fistula or graft present	37.50	33.72	31.61	35.90	-2.17* [-4.74 to 0.39]	1.60*** [0.65-2.56]	-3.90*** [-6.58 to -1.22]	0.07 [-1.31 to 1.45]
Estimated glomerular filtration rate (mL/min)	11.05	10.94	11.43	11.20	-0.26* [-0.52 to -0.00]	-0.15*** [-0.24 to -0.06]	0.07 [-0.32 to 0.47]	-0.07 [-0.17 to 0.03]
1-year all-cause mortality	19.50	16.69	21.85	21.92	-5.23*** [-7.28 to -3.18]	-2.42*** [-3.23 to -1.62]	-1.00 [-3.22 to 1.21]	-0.11 [-1.01 to 0.78]

G, group; MA, Medicare Advantage; TM, traditional Medicare.

P* < .10; *P* < .05; ****P* < .01.

*Data include 49,160 Medicare patients 67 years and older with end-stage renal disease who initiated dialysis in 2016. Adjusted differences are estimated from linear regressions adjusted for patients' sociodemographic and clinical characteristics and risk score, with month of dialysis initiation and county fixed effects. Standard errors are clustered at the county level. Estimated glomerular filtration rate is calculated using the Isotope Dilution Mass Spectrometry–traceable Modification of Diet in Renal Disease Study Equation.

did not detect significant differences in adjusted mortality. The latter comparison (TM-to-MA switchers vs TM stayers) is more prone to favorable selection bias than the former comparison (MA stayers vs TM stayers) given our finding that TM-to-MA switchers are healthier than MA stayers. The stayers-to-stayers comparison yielded no difference in predialysis nephrology care and the use of arteriovenous fistula or graft, whereas the switchers-to-stayers comparison exhibited lower rates for these recommended services for MA enrollees compared with TM enrollees.

These findings highlight the importance of accounting for enrollment switches between MA and TM to address favorable selection bias when comparing outcomes between MA and TM enrollees. To our knowledge, our study is the first to compare mortality between MA and TM stayers, accounting for the MA-TM switching behavior among Medicare beneficiaries with kidney failure.

The lack of association of MA enrollment with mortality may be explained by similar rates of predialysis care and fistula use among MA and TM stayers. Both of these measures of dialysis preparation are associated with improved patient survival after the initiation of dialysis. If MA plans used fewer resources for the care and treatment for kidney failure than TM does, our finding of no difference in mortality between MA and TM stayers may suggest the relative efficiency of MA plans; however, additional research is needed to directly assess the efficiency advantages of MA plans for patients with kidney disease.

Our findings contrast with those of previous studies that reported lower mortality for MA enrollees than TM enrollees.^{11,12,33} This discrepancy may be explained by at least 3 reasons. First, we accounted for enrollment switches between MA and TM prior to the index event (ie, dialysis initiation) by comparing MA and TM stayers. Second,

we adjusted for underlying health status of MA enrollees using the MA encounter data containing all claims of MA enrollees; these data were unavailable until 2018, when they were first released. Third, we focused on a study population with a complex medical condition: Medicare beneficiaries with kidney failure who initiated dialysis.

We note that there may remain favorable selection bias even in the stayers-to-stayers comparison. First, MA stayers may be healthier than TM stayers on unobservable dimensions not measured by risk scores and other clinical characteristics. Second, MA plans may have incentives to code enrollees' diagnoses more intensely ("upcoding") to increase risk scores, which in turn yields higher risk-adjusted capitated payments that they receive.³⁴⁻³⁶ To the extent that MA stayers are healthier than TM stayers in ways that are unobserved in our data or if MA enrollees have more intensely coded comorbidities, our findings provide a lower-bound estimate of the impact of MA on mortality.

Effective January 1, 2021, the 21st Century Cures Act for the first time allowed persons with kidney failure to enroll in or switch to MA after their dialysis initiation, with an expectation that MA plans may improve quality of care for these patients. Our results suggest that an evaluation of the impacts of the Cures Act for persons with kidney failure needs to account for possible enrollment switches between MA and TM before and after dialysis initiation. Further, our findings do not provide evidence that outcomes and access to predialysis nephrology care will improve following the expansion of MA plans to the kidney failure population.

Limitations

Our study has several limitations. First, our data include Medicare beneficiaries with kidney failure who initiated dialysis only in 2016 due

to limited availability of the MA encounter data necessary for the risk adjustment for MA stayers during 12 months prior to the dialysis initiation. The MA encounter data were available only for 2015 claims when we conducted the analysis. Second, mortality rates were measured conditional on survival until the 91st day following dialysis initiation because death records in the Death Notification Form are complete beginning with the 91st day.^{29,30} We may not capture a difference, if any exists, in mortality within 90 days from the dialysis initiation. Third, our data lacked individual-level information on income and educational attainment, although we included the zip code-level measures based on enrollees' residence. Fourth, we could not adjust for a possible difference in coding intensity between MA and TM enrollees. Fifth, we were unable to adjust fully for unobserved underlying health status of MA and TM enrollees.

CONCLUSIONS

Among Medicare beneficiaries with kidney failure who initiated dialysis, we did not find evidence of a difference in risk-adjusted 1-year mortality between MA and TM stayers, a comparison less prone to favorable selection bias than a comparison between TM-to-MA switchers and TM stayers. If there is remaining favorable selection in MA due to unobserved health status, our finding provides a lower-bound estimate of the MA impact on mortality among beneficiaries with kidney failure. Our findings suggest that after accounting for enrollment switches between MA and TM, MA plans do not differentially improve survival in the high-cost, high-need population of patients with kidney failure who initiate dialysis. ■

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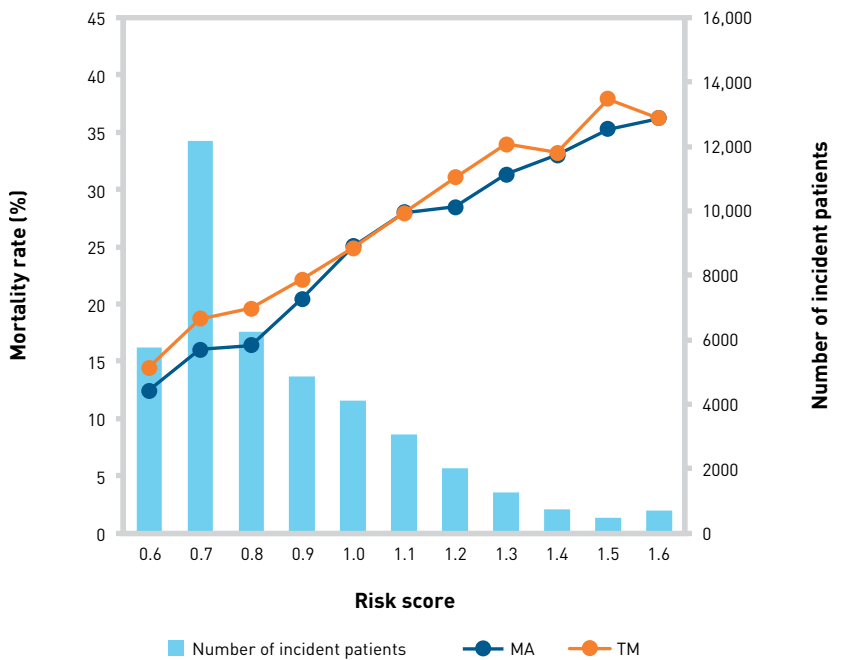
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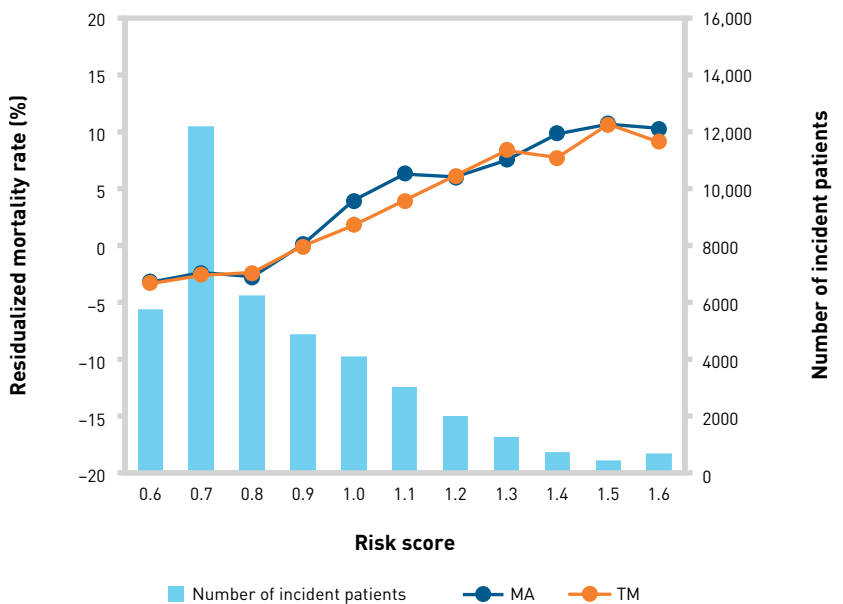
Authorship Information: Concept and design (DK, SS, RM, MR-H, RT, KHN, ANT); acquisition of data (ANT);

FIGURE 2. One-Year Mortality Rate by Risk Score*

A. Unadjusted mortality



B. Adjusted mortality



MA, Medicare Advantage; TM, traditional Medicare.

*Both MA and TM enrollees are those who maintained their MA or TM status during the 12 months prior to dialysis initiation. Each risk score bin is of width 0.1, with the first bin covering enrollees with risk score between 0.6 and 0.7, the second bin covering 0.7 to 0.8, and so on. Adjusted mortality rate (panel B) is based on a linear regression adjusted for patients' sociodemographic and clinical characteristics, as well as fixed effects for the month of dialysis initiation and county of residence; it is normalized at the mortality of MA patients with risk scores between 0.7 and 0.8.

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eAppendix Table 1. Top 10 leading causes of death

Rank	MA stayers (G1)	TM-to-MA switchers (G3)	MA-to-TM switchers (G2)	TM stayers (G4)
1	Cardiac arrest	Cardiac arrest	Cardiac arrest	Cardiac arrest
2	Withdrawal from dialysis/uremia	Withdrawal from dialysis/uremia	Withdrawal from dialysis/uremia	Withdrawal from dialysis/uremia
3	Septicemia	Septicemia	Other cause of death	Septicemia
4	Other cause of death	Other cause of death	Septicemia	Other cause of death
5	Malignant disease	Malignant disease	Congestive heart failure	Congestive heart failure
6	Congestive heart failure	Congestive heart failure	Cardia arrhythmia	Acute myocardial infarction
7	Acute myocardial infarction	Cardia arrhythmia	Acute myocardial infarction	Malignant disease
8	Cachexia/failure to thrive	Acute myocardial infarction	Pulmonary infection	Cachexia/failure to thrive
9	Cardia arrhythmia	Cachexia/failure to thrive	Malignant disease	Pulmonary infection
10	Pulmonary infection	Pulmonary infection	Cachexia/failure to thrive	Cardia arrhythmia

Notes: Data include Medicare patients with end-stage renal disease aged 67 and over who initiated dialysis in 2016.

MA=Medicare Advantage; TM=Traditional Medicare.

eAppendix Table 2. Difference in Nephrology Care and Mortality between Medicare Advantage Stayers and Traditional Medicare Stayers, by Quartile of Risk Scores

	Adjusted difference (95% CI)			
	Risk score \leq Q1	Q1 < Risk score \leq Q2	Q2 < Risk score \leq Q3	Q3 < Risk score
Nephrology care prior to dialysis	-1.39 (-3.71, 0.93)	2.26** (0.07, 4.45)	-0.07 (-2.29, 2.16)	0.67 (-1.78, 3.11)
Arteriovenous fistula or graft present	-4.42*** (-7.05, -1.78)	-0.21 (-2.44, 2.02)	1.85 (-0.90, 4.61)	0.95 (-1.96, 3.86)
1-year all-cause mortality	-1.45* (-3.14, 0.24)	0.70 (-1.50, 2.89)	-0.78 (-2.70, 1.14)	1.18 (-1.44, 3.79)

Notes: Data include Medicare patients with end-stage renal disease aged 67 and over who initiated dialysis in 2016. Adjusted differences are estimated from linear regressions adjusted for patients' sociodemographic and clinical characteristics, risk score, with month of dialysis and county fixed effects. Standard errors are clustered at the county level.

Q1=1st quartile; Q2=2nd quartile; Q3=3rd quartile; Q4=4th quartile.

*p<0.10, **p<0.05, ***p<0.01

eAppendix Table 3. Difference in Nephrology Care and Mortality between Medicare Advantage and Traditional Medicare Enrollees
(G1&G3 vs. G2&G4)

	All MA enrollees (TM-to-MA switchers and MA stayers) [G1&G3]	All TM enrollees (MA-to-TM switchers and TM stayers) [G2&G4]	Unadjusted difference (95% CI)	Adjusted Difference (95% CI)
Nephrology care prior to dialysis	79.22	78.78	0.44 (-0.37, 1.25)	0.08 (-1.02, 1.18)
Arteriovenous fistula or graft present	37.19	35.64	1.55*** (0.63, 2.47)	-0.04 (-1.34, 1.26)
1-year all-cause mortality	19.26	21.92	-2.65*** (-3.43, -1.88)	-0.35 (-1.19, 0.50)

Notes: Data include Medicare patients with end-stage renal disease aged 67 and over who initiated dialysis in 2016. Adjusted differences are estimated from linear regressions adjusted for patients' sociodemographic and clinical characteristics, risk score, with month of dialysis and county fixed effects. Standard errors are clustered at the county level.

MA=Medicare Advantage; TM=Traditional Medicare.

*p<0.10, **p<0.05, ***p<0.01

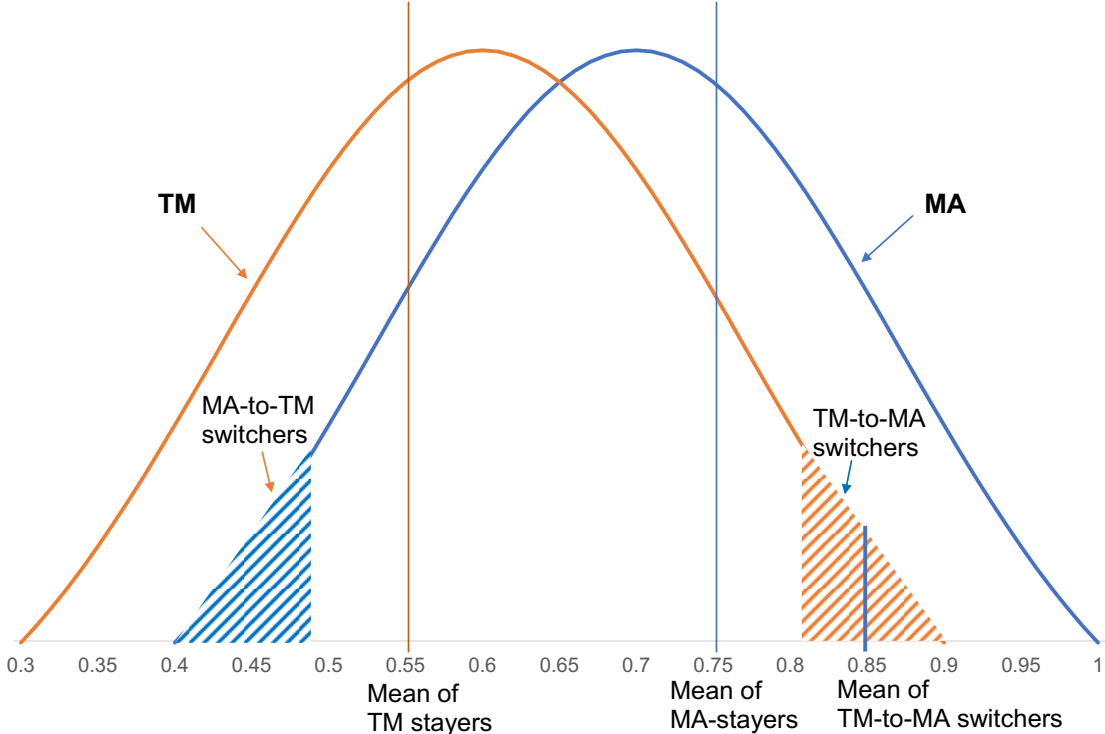
eAppendix Table 4. Difference in Nephrology Care and Mortality between Medicare Advantage Stayers and Traditional Medicare Stayers, (G1 vs. G4)

	Linear probability model		Logit model	
	Difference (95% CI)		Odds ratio (95% CI)	
Nephrology care prior to dialysis	0.32	(-0.89, 1.54)	1.03	(0.96, 1.11)
Arteriovenous fistula or graft present	0.07	(-1.31, 1.45)	1.00	(0.94, 1.06)
1-year all-cause mortality	-0.11	(-1.01, 0.78)	0.99	(0.94, 1.05)

Notes: Data include Medicare patients with end-stage renal disease aged 67 and over who initiated dialysis in 2016. Adjusted differences are estimated from linear regressions adjusted for patients' sociodemographic and clinical characteristics, risk score, with month of dialysis and county (hospital referral region) fixed effects in linear probability (logit) model. Standard errors are clustered at the county (hospital referral region) level in linear probability (logit) model.

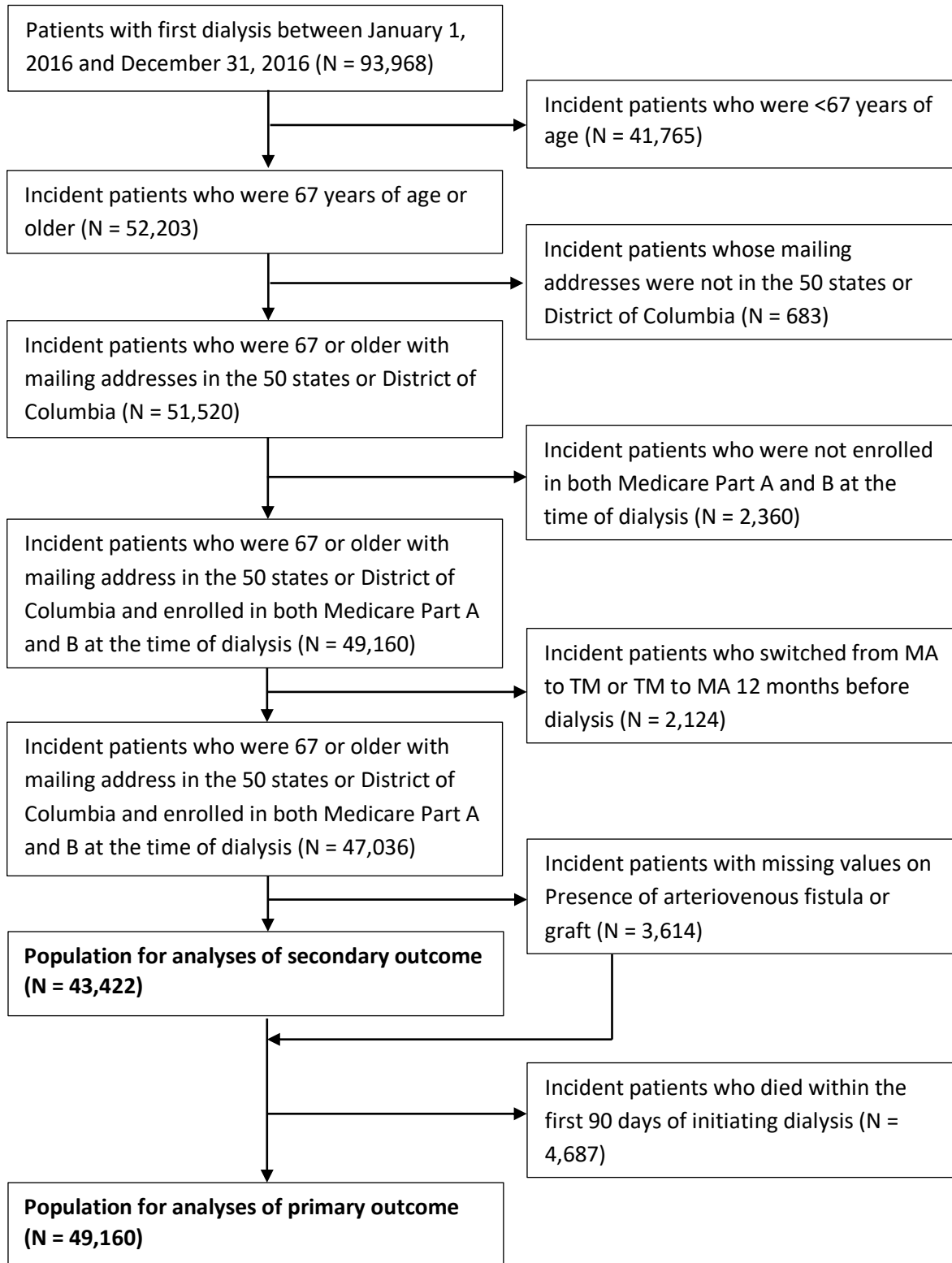
*p<0.10, **p<0.05, ***p<0.01

eAppendix Figure 1. Hypothetical Distribution of Underlying Health Status between Medicare Advantage (MA) and Traditional Medicare (TM) Enrollees



Notes: MA stayers are assumed to be healthier than TM stayers given favorable risk selection in MA, indicating that the mean of underlying health status of MA stayers (0.75 in the figure) is higher than that of TM stayers (0.55). Also, TM-to-MA switchers are assumed to be healthier than MA stayers so that the mean of health status of TM-to-MA switchers (0.85) is higher than that of MA stayers (0.75). These hypothetical cases show that the comparison between TM-to-MA switchers and TM stayers yields a larger selection bias ($0.3 = 0.85 - 0.55$) than the comparison between MA stayers and TM stayers (bias: $0.2 = 0.75 - 0.55$).

eAppendix Figure 2. Study Population Flowchart



Note: MA=Medicare Advantage; TM=Traditional Medicare.