

Table 6. Summary of Studies Comparing Appropriateness and Outcomes of Medicare Hospitalizations

Study	Study Population	Data Time Period	Data Source	Metrics and Analysis	Main Findings	Methodological Notes
a. Studies Examining Avoidable Hospitalizations						
Friedman et al. 2009	Hospitalized MA and TM beneficiaries ages 65+ in 13 states that participate in AHRQ's HCUP project.	2006	Healthcare Cost and Utilization (HCUP) files for major urban areas with 2 or more hospitals in 13 states.	AHRQ's Prevention Quality Indicators, with 13 potentially preventable admission indicators.	No difference in the percentage of potentially avoidable hospitalizations of 13 types.	This is mainly a descriptive analysis that does not control for risk or selection.
Anderson 2009	Hospitalized MA patients in 13 of the 18 ACHP member health plans compared to TM patients.	2007	Health plan provided metrics, 5% Medicare sample of claims matched to same counties but no detail given on method or way aggregate statistics were weighted or analyzed.	Preventable hospital admissions for ACSC, emergency room visits for ACSC, hospital readmissions within 30 days.	Participating health plans had lower rates of hospital admissions and emergency department visits for ambulatory care sensitive conditions than did TM beneficiaries in the same area. They also had lower average hospital readmission rates.	The study adjusts for geographic variations, but not for severity of illness or socio-demographics. The health plans participating are known to be mature, high performers. The study was produced under contract with America's Community Health Plans, which does not make a full report available on its web site.
Nicholas 2013	Hospitalized MA (largely HMO) and TM beneficiaries in 4 states.	1999 – 2005	HCUP Data (AZ, FL, NY) State Inpatient Data (SID) (NJ, 2003–2005 only) 100% Medicare Annual Beneficiary Summary File	Hospitalization rates for 4 categories of admissions: Acute Ambulatory Care Sensitivity (ASC) admissions (4); chronic ASC (9); referral-sensitive conditions (RS) (4); and "marker" conditions (3). RS admissions are used to capture potential problems accessing specialty care. Differences between "marker" MA and TM rates at the county level are used to benchmark differences between observed and expected rates, presumed to reflect unmeasured health status differentials in selection. Marker conditions are dehydration, pneumonia, ruptured appendix, and urinary tract infection.	After adjusting for selection, MA reduced rates of ACS admissions by 5.9 per 1000 beneficiaries (12%) and RS admissions by 4.02 per 1000 (21.6%) [Selection accounted for 26% of the difference in risk-adjusted rates of ACS and 35% for referral sensitive care.]. ACS reductions are driven primarily by admissions where inexpensive, short-term intervention and routine provision of maintenance medications can reduce risk of hospitalization.	This study is limited to four states. It uses econometric techniques to address gaps in data on health status differences that result from selection (beyond admission diagnosis and demographics) and takes into account geography. It also links to eligibility files to allow hospitalization rates to be developed. Nicholas notes that the study took place when policies allowed monthly disenrollment and Part D benefits were not yet available (but partly covered in many MA plans). These lessened incentives for MA to manage care and for TM to intervene earlier. Metrics relating to referral sensitive hospitalization are relatively new ones that have not been extensively tested. Their use as quality measures is contingent on the assumption that referrals are appropriate for that kind of care.

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a. Studies Examining Avoidable Hospitalizations						
Basu 2012	Hospitalized Medicare beneficiaries ages 65+ in MA (largely HMOs) by race/ethnicity, and in TM in 3 states: New York, California, and Florida.	2004	HCUP files for these 3 states.	Relative odds of an ambulatory care-sensitive admission (ACSC) in HMOs vs. TM (ACSC, based on Billings 1993 definitions). Comparison assesses odds of preventable vs. other (marker) admissions viewed as relatively urgent and less preventable. Separate analysis by state, distinguishing four subgroups in each sector: white, African American, Hispanic, and other races. Analysis includes adjustments for patient demographics, enabling characteristics (such as area income and primary care supply), and health needs (illness severity).	HMOs had lower rates of preventable hospitalizations relative to marker conditions in all 3 states across all 4 racial groups. Reductions in preventable hospitalization rates in HMOs were higher among minorities than whites in 2 of the 3 states (California and Florida).	This study is limited to three states, though they are large. They also have a large managed care presence. The design is limited to hospitalized patients. The authors included several analyses testing whether results could be explained by selection, but found limited evidence for this hypothesis.
Basu and Mobley (2007)	Hospitalized Medicare beneficiaries ages 65+ in Medicare + Choice (largely HMOs) and TM in California, Florida, New York, and Pennsylvania.	2001	HCUP files for these 4 states.	Relative odds of an ACSC in HMOs vs. TM (ACSC based on Billings 1993 definitions). Comparison assesses odds of preventable vs. other (marker) admissions viewed as relatively urgent and less preventable. Separate analyses by state with multivariate adjustment for severity of illness, county-level variables, and health resource and characteristics	In 3 of 4 states, HMO patients had lower odds of preventable vs. marker hospitalization than TM patients (the exception was Pennsylvania). The difference was largest in states with the most mature managed care. Analysis suggests the MA-TM difference may be greater in the 2 states with the most mature managed care (California and New York).	This study includes four states, though they have a large managed care presence. Design is limited to hospitalized patients. The inclusion of dual eligibles in the study may overstate the difference between MA and TM because beneficiaries who are dually eligible are more likely to be in TM (authors note that available data suggest their inclusion does not fully account for the study results).
Zeng et al. 2006	Medicare-age beneficiaries in California covered by Parts A and B and continually enrolled in Medicare HMOs or TM for the year in four large Southern California counties.	1996	Medicare enrollment data linked to California OSHPD's all-payer hospital data.	Hospitalization rate for 15 ACSC (as measured by McCall et al. criteria for elderly), total ACSC days. (To aid in interpretation, researchers also examined rates for non-ACSC.) Analysis employed simultaneous equations to adjust for health plan selection. Admissions resulting in a death were not considered ACSC, regardless of diagnosis.	After controlling for selection, those in Medicare HMOs had lower rates of ACSC admissions and days, but not other hospitalizations.	The data from this study are now relatively old (1996) and limited to Southern California. Researchers look at the probability of admission and employ techniques to control for selection.

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b. Studies of Quality of Hospital Care and Related Professional Services						
Friedman and Jiang 2010	Hospitals used by MA and TM Medicare beneficiaries discharged with non-maternal diagnosis from 13 states involved in the AHRQ HCUP project. Analysis limited to discharges from urban areas with 2+ hospitals.	2006	HCUP files for 13 states.	Risk-adjusted mortality metrics developed for 15 separate categories drawn from AHRQ inpatient quality indicators (8 surgical and 7 medical). Adjustment based on APR-DRG, age, and gender. Weighted aggregate index created. A second metric focused on Patient Safety Indicators (PSI) developed by AHRQ, with 9 PSIs for adult cases, all relating to surgical care.	MA patients were admitted to hospitals with higher risk-adjusted mortality (and somewhat lower cost) compared to TM. Both HMO and TM admit patients with higher disease severity to lower-mortality hospitals. There is more variability in MA for where surgical patients are admitted than in TM, with MA using hospitals with higher and lower risk-adjusted mortality. However, MA patients also were more likely to be admitted to hospitals with fewer patient safety	The discrepancy in relative findings for MA and TM on mortality versus and patient safety events complicates interpretation. The authors say this pattern could reflect greater MA control over discretionary admissions (patient safety measures generally exclude these admissions).
Huesch 2010	Florida Medicare managed care (mostly HMO) and TM patients with percutaneous coronary interventions discharged from state-regulated Florida hospitals.	2003 – 2006	Discharge data from Florida Department of Health's Agency for Health Care Administration, linked with licensure data.	Whether or not patient used a cardiologist with a particular risk-adjusted profile rank compared to peers (average mortality and discharge directly home) as measured by lowest/lowest quartile/below median among peers). Analysis based on patients staying 2+ days without AMI. There were 67,476 patients treated by 486 Florida physicians performing 10 or more cases per quarter. Patient risk adjustment employed.	Cardiologists used by managed care patients had similar training to those used by TM but more stent experience (an asset). Risk-adjusted length of stay did not differ consistently between managed care and TM. However, Medicare managed care patients were significantly less likely to see a physician with a mortality profile below the median and also less likely to be discharged home than were TM patients.	This study is based on a single state (Florida) that is also known to have unique features. While sensitivity analysis does not indicate that selection explains the use of cardiologists with worse outcomes, authors note that unobserved patient differences may explain them (sicker patients in managed care and concentration in certain providers).

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b. Studies of Quality of Hospital Care and Related Professional Services						
Basu and Friedman 2013	Medicare beneficiaries 65+ in Florida hospitals by HMO and TM.	2002	HCUP data for Florida	Likelihood of one of 9 Patient Safety Indicators (PSIs) related to pneumothorax, infections, hemorrhage, post-operative respiratory failure, embolism or sepsis, and accident puncture or laceration. Patients transferred from another hospital excluded. Multivariate methods used to adjust for patient characteristics, including severity and hospital characteristics (including overall quality).	Medicare HMO patients had a higher risk of three adverse outcomes than TM patients, even though the overall quality of hospitals used by HMOs was higher.	This study focuses on one state and one year; Florida is known to have unique features. The study distinguishes between overall hospital quality and the extent of adverse outcomes for patients in MA and TM within those hospitals.
Luft 2003	Medicare beneficiaries in California with Parts A and B hospitalized for acute myocardial infarction (AMI).	1994 – 1996	California OSPHD data from the Hospital Outcomes Project, Medicare eligibility files, death certificate data.	Risk-adjusted 30-day mortality rates (observed vs. expected), length of stay, and revascularization within 30 days. To obscure health plan identities, larger plans were subdivided geographically with a resulting 17 plans. Risk adjustment for comorbidity performed two ways, one more conservative than the other.	Risk-adjusted death rates were slightly higher in TM but some plans had different practice patterns and performed better (lower LOS and revascularization rates) than others.	This study includes risk-adjusted outcome measures that take into account patient history; however, it focuses on a single state with a mature managed care market. The researchers note that the findings are not fully explained by a “Kaiser effect;” that is, the findings also apply to plans other than Kaiser Permanente.
Erickson et al. 2000	Patients ages 65+ in managed care or TM who were discharged from lower-mortality New York State hospitals after coronary artery bypass graft survey (CABG). Analysis compares TM, Medicare managed care, private FFS, and private managed care.	1993 – 1996	New York State hospital discharge databases.	Probability of a patient receiving CABG surgery at a lower-mortality hospital. (Cardiac centers in New York were divided into lower-(14) and higher-(17) mortality groups based on volume [weighted average-adjusted mortality rates]). Analysis adjusted for distance to the nearest lower- and higher-mortality centers.	Compared with private FFS, patients with private managed care and Medicare managed care were less likely to receive CABG at a lower-mortality hospital. Patients in TM used lower-mortality hospitals—more similar to private FFS patients.	This study focuses on a single state known for its strong regulatory climate. Only a small number of hospitals were proximate to many patients.

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c. Studies of Readmission Rates						
Friedman et al. 2012	TM and MA beneficiaries discharged from hospitals in 5 states: Arizona, California, Florida, Massachusetts, and Tennessee. Analysis limited to beneficiaries in core-based statistical areas (CBSA).	2006	HCUP files for 5 states.	Rate of first readmission (excluding pregnancy and trauma) within 30 days for patients discharged alive from the hospital in MA or TM sectors. Analysis adjusts for type of initial admission (medical diagnosis, minor diagnostic or therapeutic, or major procedure), severity of illness, and number of chronic conditions.	While unadjusted MA readmissions were lower than TM, TM readmission rates were lower after risk adjustment and control for selection into MA plans.	Based on only five states, this study used probit analysis and instrumental variables to control for endogeneity of choice of plan. This study differs from many other readmission studies in that it focuses on initial readmission for the population vs. cumulative burden of subsequent readmissions, which may have different causal patterns. It also includes adjustment for risk and selection.
Lemieux et al. 2012	Medicare beneficiaries hospitalized in 2006–2008 included in the MedAssurant MORE registry (MA) or 5% Medicare claims file (TM); core analysis includes only those ages 65+.	2006 – 2008	MedAssurant proprietary MORE Registry (MA) and 5% Medicare claims and administrative files (TM). Complementary analysis for 2007 from 5 state discharge abstracts (California, Nevada, Washington, Texas, and North Carolina).	Unadjusted all-cause rate of readmission (excluding rehabilitation readmissions) by patients in TM and MA. Sensitivity test involves adjustment for risk of readmission by diagnosis code. Alternative methods (Jencks, Anderson) used to calculate readmission rates.	2006–2008 comparisons of MA and TM readmissions in quarter for index admission in prior 3 quarters for those 65+ was 18.4% in TM vs. 14.4% in MA. Pattern of results does not differ greatly when the Jencks method is used. Using a DRG-based risk-adjustment reduces readmissions but does not completely erase the differential. Similar results apply from analysis of 5 state hospital discharge systems.	The MORE registry may not be representative of MA generally. The authors indicate it is based on individuals in 11 de-identified health plans, including one quarter of MA enrollees in 2008. The distribution of registry data also differs from TM, with more ages 80+ enrollees and under-65 disabled beneficiaries. Geographic distribution also varies and these differences, along with differences in patient risk and selection, were not adjusted for in the analysis. Includes all readmissions (including multiple readmissions for the same patient). The research was supported by AHIP, the industry trade association, in which the lead author is based.
Smith et al. 2005	Medicare beneficiaries ages 65+ discharged for acute ischemic stroke in a large managed care organization (HMO) or TM.	1998 – 2000	HMO data from a company with 11 Medicare + Choice plans, largely in the eastern U.S.; Medicare TM claims data for beneficiaries in the same counties.	Time in days from index hospital admission to death or re-hospitalization (excluding rehabilitation hospitalizations). Prior-year utilization (hospital and physician) used to adjust for 30 comorbid conditions. Cox regression methods used to assess hazard ratios for readmission or death.	30-day readmission rates were higher for HMO than TM, though no difference in mortality. More rigorous adjustment for HMO membership showed increased mortality rates in HMO at 30 days, though no differences later. No differences in warfarin use (from outpatient claims) in HMOs or TM. Reasons for readmissions differed between sectors.	This analysis includes diagnostic criteria and controls for baseline health status, though not necessarily controls for other factors that could affect readmission rates differentially by sector. Authors suggest that differences in patterns of post-acute care and TM reimbursement changes could influence results.

SOURCE: Authors' analysis based on review of published papers.