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Where do Elderly Veterans Obtain Care for Acute Myocardial Infarction: Department of Veterans Affairs or Medicare?

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Where Do Elderly Veterans Obtain Care for Acute Myocardial Infarction: Department of Veterans Affairs or Medicare?

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Objective. To examine Department of Veterans Affairs (VA) and Medicare hospitalizations for elderly veterans with acute myocardial infarction (AMI), their use of cardiac procedures in both systems, and patient mortality.

Data Sources. Merging of inpatient discharge abstracts obtained from VA Patient Treatment Files (PTF) and Medicare MedPAR Part A files.

Study Design. A retrospective cohort study of male veterans 65 years or older who were prior users of the VA medical system (veteran-users) and who were initially admitted to a VA or Medicare hospital with a primary diagnosis of AMI at some time from January 1, 1988 through December 31, 1990 ($N = 25{,}312$). We examined the use of cardiac catheterization, coronary bypass surgery, and percutaneous transluminal coronary angioplasty in the 90 days after initial admission for AMI in both VA and Medicare systems, and survival at 30 days, 90 days, and one year. Other key measures included patient age, race, marital status, comorbidities, cardiac complications, prior utilization, and the availability of cardiac technology at the admitting hospital.

Principal Findings. More than half of veteran-users (54 percent) were initially hospitalized in a Medicare hospital when they suffered an AMI. These Medicare index patients were more likely to receive cardiac catheterization (OR 1.24, 95% C.I. 1.17–1.32), coronary bypass surgery (OR 2.01, 95% C.I. 1.83–2.20), and percutaneous transluminal coronary angioplasty (OR 2.56, 95% C.I. 2.30–2.85) than VA index patients. Small proportions of patients crossed over between systems of care for catheterization procedures (VA to Medicare = 3.3%, and Medicare to VA = 5.1%). Many VA index patients crossed over to Medicare hospitals to obtain bypass surgery (27.6 percent) or coronary angioplasty (12.1 percent). Mortality was not significantly different between veteran-users who were initially admitted to VA versus Medicare hospitals.

Conclusions. Dual-system utilization highlights the need to look at both systems of care when evaluating access, costs, and quality either in VA or in Medicare systems. Policy changes that affect access to and utilization of one system may lead to unpredictable results in the other.

Key Words. AMI, cardiac procedures, access, veterans, Medicare

Federal programs face increasing pressure to move toward models of managed care, but planners, researchers, and physicians have long been hampered by inadequate information on out-of-system use by their patients. The care of veterans exemplifies this problem. Of the approximately 23 million veterans, only 10 percent receive either inpatient or outpatient care in the Department of Veterans Affairs (VA) health system, and about half of these "veteran-users" are also eligible to receive Medicare (Fisher and Welch 1995). Since the number of veterans over the age of 65 is expected to grow substantially (Romeis, Gillespie, and Coe 1988; Kosloski, Austin, and Borgatta 1987), ascertaining the degree to which this population uses both VA and Medicare services (i.e., dual use) is important from both clinical and policy perspectives. The dual use of services by veteran-users may create system interdependencies that may influence access to care, system costs, quality of care, and future demand estimates in both VA and Medicare (Smith 1987; Cowper et al. 1993).

Acute myocardial infarction (AMI) is a highly prevalent condition with both high mortality and morbidity in people age 65 and over (National Center for Health Statistics 1992). Cardiac procedure rates for this population are frequently used to evaluate access to medical care, patterns of health care utilization, system costs, and quality of patient care (Ayanian and Epstein 1991; Peterson et al. 1994; Wenneker, Weissman, and Epstein 1990; Dittus, Roberts, and Adolph 1987). Veteran-users over the age of 65 have the ability to move between the VA and Medicare systems during their AMI episode of care. Thus, veteran-users with AMI who are Medicare-eligible may be initially

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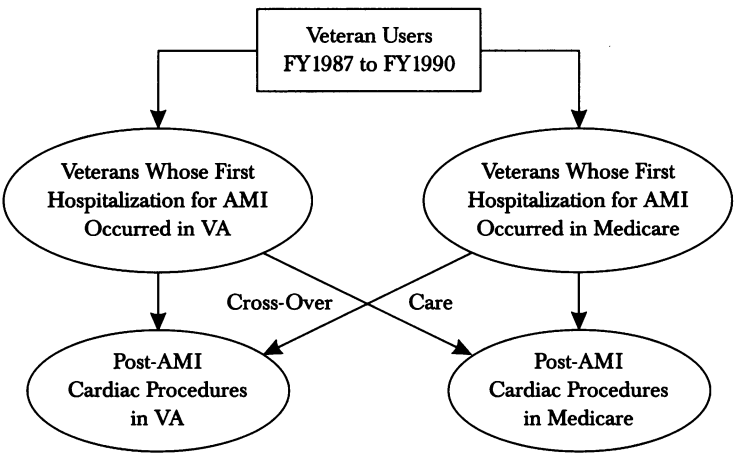
hospitalized in either a VA or Medicare hospital, and they can also obtain subsequent cardiac procedures from either system of care. The objectives of this study are to examine VA and Medicare hospitalizations for veteran-users with AMI, their use of cardiac procedures in both systems, and patient mortality. This study explores where veteran-users with AMI are initially hospitalized and identifies the cardiac procedures received and the medical system in which they are performed (Figure 1).

METHODS

DATA SOURCES

To identify where veterans eligible to receive VA health services were initially hospitalized with AMI, we merged several sources of VA and Medicare data. We first used the Patient Treatment File (PTF) to create a national veteran-user denominator file of all veterans who had obtained any VA inpatient or outpatient services from January 1, 1987 to December 31, 1990. The PTF is a national abstract database of VA service utilization that, because of the availability of patient identifiers, enables creation of a longitudinal record of care across all VA hospitals and linkage of VA data with non-VA databases such as Medicare. Veterans age 65 and over with AMI admitted to Veterans Affairs Medical Centers (VAMCs) and their use of cardiac procedures in VA

Figure 1: Access to Cardiac Procedures in VA and Medicare by Veteran-Users



were obtained from a national retrospective AMI study (Wright et al. 1996). By virtue of their admission to a VAMC, these veterans were identified as veteran-users admitted to VA. We further linked this VA AMI cohort with Medicare MedPAR Part A files to capture post-infarction cardiac procedures performed in Medicare hospitals.

Veteran-users age 65 and older who were admitted to Medicare hospitals and their use of cardiac procedures were obtained by linking the veteran-user denominator file with data from the AMI Patient Outcome Research Team (PORT) at Harvard's Department of Health Care Policy (Udvarhelyi, Gastonis, Epstein, et al. 1992). The AMI PORT examined a national cohort of Medicare patients hospitalized with AMI and their subsequent use of cardiac procedures. We identified patients hospitalized in Medicare who had prior use of VA services. This eliminated those veterans who were hospitalized in Medicare and then used VA services only subsequent to their AMI. We further linked the Medicare AMI cohort with the Patient Treatment File to obtain cardiac procedures performed in VA facilities.

The data records of veteran-users admitted to both the VA and Medicare systems were pooled to identify the initial system of AMI hospitalization and to classify veteran-users as VA index or Medicare index AMI patients. All-cause mortality was obtained from the Veterans Affairs Beneficiary Identification and Record Location Subsystem (BIRLS) for VA index AMI patients and the Health Insurance Eligibility Write Off file (HISKEW) for Medicare index AMI patients. The BIRLS and HISKEW files have been shown to be concordant for mortality in more than 98 percent of cases (Fleming, Fisher, Chang, et al. 1992).

Patient Population

The cohort was drawn from a population of patients with AMI (ICD-9-CM code 410; January 1, 1988 through December 31, 1990), as identified by VA or Medicare studies, whose patient characteristics, data collection protocol, and data validity had been previously reported (Wright et al. 1996, Udvarhelyi, Gastonis, Epstein, et al. 1992). Generally, the VA and Medicare populations included patients who were initially hospitalized with a primary (VA) or principal (Medicare) diagnosis of AMI. Patients were excluded if they were discharged alive with a length of stay less than five days (this exclusion eliminated those who were admitted only to rule out a myocardial infarction) or had been admitted in the previous 365 days with AMI. The VA population also excluded patients with long-term nursing home length of stay, patients who had a cardiac catheterization or revascularization procedure in

the 90 days prior to admission for the AMI, or patients in which an AMI may have been a complication of non-cardiac surgery. See the Appendix for a complete description of the exclusion criteria for each study.

Patient Characteristics

Demographic variables used in the analyses included patient age and race (i.e., white, African American, or other). The type of prior VA utilization (i.e., inpatient or outpatient services) was also captured. We grouped ICD-9-CM codes into 11 clinically distinct comorbid categories (Normand et al. 1995). These comorbid categories were designed to reflect the patient's clinical status on admission and to be unrelated to cardiac treatment. We measured post-infarction cardiac complications using a three-stage index developed from the ICD-9-CM codes. Stage I included cases where no AMI complication code was found. Stage II was defined as moderate cardiac complications (e.g., congestive heart failure, pericarditis, non-life-threatening arrhythmia, or stroke). Stage III consisted of severe cardiac complications (e.g., cardiogenic shock, ventricular tachycardia, or cardiac arrest). We also identified the year of AMI hospitalization.

VA and Medicare Index Hospitals

The hospital–either a Department of Veterans Affairs or Medicare facility–to which the patient was first admitted with a primary or principal diagnosis of AMI was designated as the patient's "index" hospital. Our analysis of procedure utilization and mortality linked the patient with the characteristics of the index hospital. All VA and Medicare hospitals were classified into one of three types according to the availability of cardiac technology. We used volume of procedures performed to classify hospital type as basic service hospitals (fewer than five cardiac catheterizations and fewer than ten coronary bypass surgeries or coronary angioplasties); cardiac-cath-only hospitals (five or more cardiac catheterizations and fewer than ten coronary bypass surgeries or coronary angioplasties); and cardiac surgery hospitals (five or more cardiac catheterizations and ten or more coronary bypass surgeries or coronary angioplasties).

Procedure Utilization and Outcomes

We evaluated the utilization of three cardiac procedures: cardiac catheterization (ICD-9-CM codes 37.22–37.23, 88.52–88.57), coronary bypass surgery (ICD-9-CM codes 36.10–36.19), and percutaneous transluminal coronary

angioplasty (ICD-9-CM codes 36.00–36.02, and 36.05) within 90 days of initial admission for AMI on either the initial or a subsequent hospitalization. For patients initially admitted to either VA or Medicare hospitals, we identified procedures performed in both VA and Medicare. All-cause mortality was evaluated within 30 days, 90 days, and one year of the initial admission for AMI to either a VA or Medicare hospital. We had VA and Medicare data for 1991 with which to ascertain procedure use and mortality for patients discharged during 1990.

Analysis

The analysis explores the association between the initial system of hospitalization and the use of cardiac procedures and mortality. Summary statistics were tabulated for patient characteristics by site of initial hospitalization, including Pearson χ^2-test or F-test, as appropriate. Cardiac procedure rates were calculated for those procedures performed within the initial system of hospitalization, procedures performed within the other system of care (i.e., cross-over procedures), and total procedures. Individual multiple logistic regression models were used to determine the likelihood that a patient would undergo each cardiac procedure (i.e., catheterization, bypass surgery, coronary angioplasty) as a function of the initial system of hospitalization for AMI. Each model controlled simultaneously for patient age, race, cardiac complications, comorbid conditions, availability of cardiac technology, and year of AMI. The same modeling techniques were used to examine 30 days, 90 days, and one-year patient mortality. Odds ratios (ORs) were reported using two-tailed 95 percent confidence intervals (C.I.s).

RESULTS

Veteran-User Characteristics

There were 1.5 million veterans age 65 and over who used any inpatient or outpatient VA medical service in calendar years 1987 through 1990. Between January 1, 1988 and December 31, 1990, 25,312 of these veteran-users were initially admitted to a VAMC (VA index) with a primary diagnosis of AMI or to a Medicare hospital (Medicare index) with a principal diagnosis of AMI. This group constituted the AMI cohort for the study.

More than half (54 percent) of the AMI cohort were initially admitted to Medicare hospitals (Table 1). Medicare index patients were slightly younger and less likely to be African American than were VA index patients. VA index

Table 1: Veteran-User Characteristics by Site of Initial Hospitalization for AMI

Veteran-User Characteristics	*VA Hospital (n = 11,647)*	*Medicare Hospital (n = 13,665)*	*Overall (n = 25,312)*
Veteran-users with AMI (%)	46.0	54.0	100.0
Mean age (±std)	71.7(±6.2)	70.8(±4.8)	71.2(±5.5)
Race (%)			
White	83.9	91.5	88.0
African American	12.1	6.8	9.2
Other	4.0	1.7	2.8
Utilization in VA in year prior to index hospital (%)			
Inpatient and outpatient	35.3	18.0	25.9
Outpatient only	46.2	67.1	57.5
None	18.5	14.9	16.6
Cardiac complications (%)			
None coded	45.2	38.6	41.5
Moderate	49.3	54.6	52.3
Severe	5.5	6.8	6.2
Comorbidities (%)*			
Diabetes mellitus	21.2	13.3	16.9
Diabetes with end organ damage	5.2	5.8	5.5
Pulmonary disease	21.6	18.2	19.8
Type of index hospital (%)			
Basic service	37.4	39.8	38.7
Cardiac cath-only	21.7	32.3	27.4
Cardiac surgery	41.0	27.8	33.9

Note: Associations between initial site of hospitalization and veteran-user characteristics were significant at $p < .0001$ using χ^2 or t-test, as appropriate.

†VA database codes up to nine diagnoses other than AMI, Medicare database codes up to four. The other eight comorbitities had less than 5 percent: cancer, renal failure, neurological disorder, dementia, paralysis, liver disease, major psychoses, alcohol/drug abuse.

patients had been more frequently hospitalized in VA medical centers during the prior year and less frequently used VA outpatient services exclusively than did Medicare index patients. VA index patients had fewer cardiac complications but more diabetes mellitus and pulmonary disease coded than Medicare index patients. Finally, the highest percentage of VA index patients were initially admitted to a cardiac surgery hospital (41 percent), while the highest percentage of Medicare index patients were initially admitted to a basic service hospital (39.8 percent).

Table 2: Cardiac Procedure Rates by Site of Initial Hospitalization for AMI for Veteran-Users

	VA Hospital, Percent	*Medicare Hospital, Percent*
Catheterization within index system	31.4	38.4
Catheterization in either system	32.4	40.4
CABG within index system	6.5	13.3
CABG in either system	8.8	13.7
PTCA within index system	4.3	11.0
PTCA in either system	4.8	11.2
REVASC within index system	10.5	24.2
REVASC in either system	13.5	24.9

Note 1: Rates for procedures performed within 90 days of admission for AMI.

Note 2: REVASC = PTCA or CABG procedure.

Note 3: Associations between initial site of hospital and undergoing each cardiac procedure were significant at $p < .0001$ using χ^2 statistic.

Use of Cardiac Procedures

AMI patients admitted to VA or Medicare hospitals underwent cardiac procedures in the system to which they were initially admitted (index system) or in the other system of care. Table 2 shows that unadjusted cardiac procedure rates in the index system were significantly higher for AMI patients initially admitted to Medicare hospitals (catheterization = 38.4 percent, bypass surgery = 13.3 percent, and coronary angioplasty = 11.0 percent) than AMI patients initially admitted to VA hospitals (catheterization = 31.4 percent; bypass surgery = 6.5 percent; and coronary angioplasty = 4.3 percent). These differences in rates between VA and Medicare index systems remained when procedures performed in either system of care were included. Table 3 shows the different rates at which AMI patients crossed over to the other system of care to obtain cardiac procedures. Cross-over rates for cardiac catheterization were small in both directions. In contrast, cross-over procedure rates for revascularization were much higher from VA to Medicare. For example, 27.6 percent of VA index patients who received bypass surgery and 12.1 percent of VA index patients who received coronary angioplasty, obtained their procedures in Medicare compared to a smaller percentage of patients who crossed over from the Medicare to VA system (bypass surgery = 3.4 percent; coronary angioplasty = 2.1 percent).

Table 3: Percentage of Cardiac Procedures Performed in Other System of Care

Cardiac Procedures	*VA Index to Medicare, Percent*	*Medicare Index to VA, Percent*
Catheterization (%)	3.3	5.1
CABG (%)	27.6	3.4
PTCA (%)	12.1	2.1
REVASC (%)	22.3	2.8

Note 1: Figures represent the proportion of the number of cross-over procedures over the total number of procedures performed (VA and Medicare) within each index system.

Note 2: REVASC = PTCA or CABG procedure.

Table 4: Adjusted Odds Ratios for Cardiac Procedure Use within 90 days by Initial Site of Hospitalization for AMI

	VA Index Hospital	*Medicare Index Hospital*
Procedures	*OR*	*OR (95% C.I.)*
Catheterization within index system	1.0	1.24 (1.17–1.32)
Catheterization in either system	1.0	1.29 (1.22–1.36)
CABG within index system	1.0	2.01 (1.83–2.20)
CABG within either system	1.0	1.43 (1.31–1.55)
PTCA within index system	1.0	2.56 (2.30–2.85)
PTCA within either system	1.0	2.28 (2.05–2.53)
REVASC within index system	1.0	2.52 (2.34–2.71)
REVASC within either system	1.0	1.91 (1.78–2.05)

Note 1: REVASC = PTCA or CABG procedure.

Note 2: Catheterization, CABG, PTCA, and REVASC models were adjusted for patient age, race, comorbid conditions, availability of cardiac technology, and year of AMI admission.

Table 4 shows results of the logistic models after adjusting for baseline characteristics. Medicare index patients were more likely to undergo cardiac catheterization (OR 1.24, C.I. 1.17–1.32), bypass surgery (OR 2.01, C.I. 1.83–2.20), and coronary angioplasty (OR 2.56, C.I. 2.30–2.85) than VA index patients. Analyses that included cardiac procedures obtained in either system of care also showed that Medicare index patients were significantly more likely to receive cardiac procedures than VA index patients, although the odds ratios for bypass surgery and coronary angioplasty were diminished

when procedures in either system were included. An analysis solely of patients who survived for more than 48 hours after admission showed similar results.

Mortality

The mortality rate in the AMI cohort was 19.9 percent at 30 days, 24.9 percent at 90 days, and 33.9 percent at one year. These mortality rates were similar to those reported for other AMI patients age 65 and over who were initially admitted to Medicare hospitals (Udvarhelyi, Gastonis, Epstein, et al. 1992). Unadjusted mortality rates at 30 days, 90 days, or one year were not significantly different between VA index patients (19.7 percent, 25.0 percent, and 34.8 percent, respectively) and Medicare index patients (20.1 percent, 24.8 percent, and 33.2 percent, respectively). Table 5 shows that, after adjustment for baseline characteristics, the odds of death at 30 days (OR 1.04, C.I. 0.97–1.11), 90 days (OR 1.04, C.I. 0.97–1.10), and one year (OR 1.02, C.I. 0.96–1.08) were not statistically different between VA and Medicare index patients. These analyses were also performed on patients who survived the first 48 hours after admission, and there was no significant change in the odds ratios.

DISCUSSION

Veterans over age 65 are uniquely eligible for federally financed care in two systems. These two systems have different organizational and reimbursement structures. Planning and financing for the two systems require information about differential or preferential use of services. Four findings in this study are notable with regard to patterns of care between the two systems. First, more than half of the users of the VA health care system who suffered an

Table 5: Adjusted Odds Ratios for Mortality by Initial Site of Hospitalization

	VA Hospital	*Medicare Hospital*
Procedures	*OR*	*OR (95% C.I.)*
30-Day	1.0	1.04 (0.97–1.11)
90-Day	1.0	1.04 (0.97–1.10)
One Year	1.0	1.02 (0.96–1.08)

Note: 30-day, 90-day, and one-year logistic regression models are adjusted for patient age, race, cardiac complications coded, comorbid conditions, availability of cardiac technology, and year of AMI admission.

AMI were initially hospitalized in a Medicare hospital. Second, veteran-users with an AMI who were initially admitted to Medicare hospitals were more likely to receive cardiac procedures than veteran-users initially admitted to VA hospitals. Third, a significant minority of veteran-users initially admitted to VA with an AMI did cross over to Medicare to obtain revascularization procedures. Finally, in spite of differences in patterns of care, veteran-users with AMI who were initially admitted to VA or Medicare hospitals had similar mortality after adjustment for patient characteristics.

This is the first study to examine the dual use and outcomes for a well-defined, national cohort of veterans. By focusing on utilization that followed a documented myocardial infarction, our study examined comparable patients who had established contact with either health care system. The findings of this study, however, may be limited by caveats associated with the use of secondary databases (Romano and Luft 1992). Our database did not contain detailed clinical information (e.g., cardiac ejection fraction, use of thrombolytics) that could account for observed differences in utilization and outcomes (Jollis, Ancukiewicz, DeLong, et al. 1993). To address potential inaccuracies in coding (Iezzoni 1990), we conducted a review of over 700 VA medical records, validating the diagnoses of AMI (94 percent) and the coding of cardiac procedures (98 percent).

We found that more than half of veteran-users with AMI obtained their initial care in Medicare hospitals. In an earlier regional study examining dual use of VA and Medicare services by veterans, investigators found that 36.1 percent of initial hospitalizations for AMI occurred in Medicare (Fleming, Fisher, Chang, et al. 1992). That study, however, defined a veteran-user cohort based only on prior VA inpatient patient use, and this may account for the lower percentage of veterans admitted to Medicare hospitals compared with those in our study. More recently, in a national study of VA/Medicare data for 1989, researchers reported that approximately 89 percent of veteran-users age 65 and older were eligible for Medicare and approximately 50 percent had a history of some Medicare use (Fisher 1994). This is consistent with our findings for the AMI veteran-user population.

What factors influence where veteran-users are hospitalized for AMI? We might speculate that the distance between the veteran-user's residence and the closest hospital influences the distribution of hospital admissions (Luft, Garnick, Mark, et al. 1990; Joseph and Phillips 1984). This may be particularly true given the acute life-threatening nature of AMI and the need to obtain medical care immediately, although we have no direct evidence from this study to support this conjecture. The hospital where veteran-users are initially

admitted for cardiac care may also be attributed to characteristics of local emergency transport services (e.g., service protocols) and the availability of emergency departments (e.g., not all VA hospitals have this service). We found that a large majority of the Medicare index patients had previously used VA for ambulatory services only. This may suggest that, because of Medicare's lack of drug coverage and higher out-of-pocket costs (i.e., deductibles and copayments), many veteran-users with limited economic resources seek VA ambulatory and prescription services, but go to a Medicare hospital when they need acute inpatient care (General Accounting Office 1994). The much larger number of nonfederal, acute care hospitals (approximately 6,000) compared to VA hospitals ($n = 171$) that are located throughout the country may also be a factor in the percentage of patients admitted to both systems.

This study adds "system of care" to other nonclinical factors that have been documented to influence the utilization of cardiac procedures for AMI patients–such as gender, race, payer status, and availability of technology (Ayanian and Epstein 1991; Peterson et al. 1994; Wenneker, Weissman, and Epstein 1990; Blustein 1993). For this population of veteran-users, the rates of cardiac procedures vary depending on the system of initial hospitalization after adjusting for these factors. Veteran-users initially admitted to Medicare hospitals were 24 percent more likely to receive cardiac catheterization and more than two times more likely to receive revascularization procedures within that system than were veteran-users initially admitted to VA hospitals. These differences were found despite the fact that more VA index patients initially were admitted to cardiac surgery hospitals than Medicare index patients (41 percent versus 28 percent, respectively) and the established association between on-site availability of cardiac technology and greater use of the technology (Wright et al. 1996). Differences in utilization rates may also be attributable to differences in the clinical indicators for procedures in patients who were admitted to VA and Medicare hospitals, differences that we were not able to document in our administrative database.

Our results indicate that cross-system utilization of cardiac procedures occurred after initial admission for AMI. In a regional study, Fleming reported that for veteran-users with AMI who were initially admitted to VA and who received cardiac bypass surgery, 13.7 percent crossed over to Medicare to obtain their procedure (Fleming, Fisher, Chang, et al. 1992). Although small proportions of veteran-users in our study crossed over between systems of care for catheterization procedures (VA to Medicare = 3.3 percent and Medicare to VA = 5.1 percent), many more VA index patients crossed over to Medicare hospitals to obtain bypass surgery (VA to Medicare =

27.6 percent) or coronary angioplasty (VA to Medicare = 12.1 percent). Further analyses of this VA to Medicare revascularization cross-over group showed that three quarters of these patients were initially admitted to VA hospitals that did not have the specific technology on-site (i.e., basic service and cardiac-cath-only hospitals). Thus, any patient requiring revascularization had to be transferred to a different facility. There are a number of reasons why patients may be transferred from VA to Medicare hospitals in spite of the VA regionalized health care system that has restricted technology to certain referral institutions. Some locations have sharing agreements between VAMCs and local Medicare hospitals to provide services not available at the VAMC. Patients may prefer to go to a Medicare hospital because of proximity for them and family members or because of reputation.

A limited number of studies have investigated the outcomes of patients receiving care at VA and private hospitals. A VA study of surgical procedures found no significant difference between VA and private hospitals in postoperative mortality rates (Department of Veterans Affairs 1989; Stremple et al. 1993). Another twin-hospital study of AMI patients reported similar rates of inpatient mortality for patients treated in a VA and private hospital (Rosenthal, Larimer, and Owens 1994). We found that users of the VA had similar mortality rates regardless of whether they were initially admitted to a VAMC or to a private hospital. These results are not consistent with the hypothesis that differences exist in the effectiveness of care between the two systems. Although we have no a priori reason to hypothesize any baseline differences in severity of illness, we recognize that unmeasured differences in baseline severity may remain. Therefore, firm conclusions about the effectiveness of the two systems of care require both detailed measures of severity of illness at the time of admission and comprehensive measures of health outcomes.

Our findings have several important policy implications for managers and for physicians. First, the relatively high rate at which services are provided "out-of-system" poses a major challenge to those in either system who are charged with measuring or managing the cost of care. Policy changes that result in apparent cost savings in one system may lead to unpredictable (and unknown) increased costs in the other. Most important, however, are the clinical implications. The magnitude of the dual-system use presented in this specific example highlights the common problem of clinical discontinuity of care that may be associated with worse health outcomes (Wasson, Sauvigne, Mogielnicki, et al. 1984). Although many of the instances of cross-system utilization may have been well coordinated by the clinicians involved, this

magnitude of cross-utilization creates many opportunities for poor coordination and miscommunication. This study also raises the question of why different patterns of care exist that are not clearly related to differences in outcomes. Further work to answer these questions may result in higher quality and more economical care in both systems.

APPENDIX A:
Exclusion Criteria Used by VA and Medicare AMI Studies

Exclusion Criteria	*VA AMI Study*	*Medicare AMI Study*
First surgical procedure not for cardiac surgery, catheterization, PTCA, or minor procedure such as pacemaker placement	x	
Discharged alive within 5 days of admission	x	x
Hospitalization for AMI in prior year	x	x
Underwent cardiac catheterization or revascularization procedures in 90 days prior to admission	x	
Length of stay exceeding 180 days	x	
Fifth digit ICD-9-CM code of "2," indicating a patient with recent AMI admitted for subsequent care	x	
Cases with end-stage renal disease		x
HMO patients with incomplete data		x

Note: VA study final cohort, $n = 24{,}229$; Medicare study final cohort, $n = 638{,}420$.

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