

A Comparison of Medicare Fee-for-Service and a Group-Model Health Maintenance Organization in the Inpatient Management and Long-Term Survival of Elderly Individuals with Syncope

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Abstract

Objective: To compare the management and survival of elderly patients hospitalized with syncope in 2 healthcare delivery systems.

Study Design: Retrospective cohort.

Patients and Methods: Using hospitalization records from Medicare and a group-model health maintenance organization (HMO) in Oregon, we identified individuals with an admission or discharge diagnosis of syncope between 1992 and 1994. Among patients 65 years or older (median age = 79 years), we randomly selected a sample of the standard Medicare patients (primarily fee-for-service; n = 473) and all of the group-model HMO patients (n = 583). Use of inpatient testing and consultation was ascertained by chart review; all-cause mortality was obtained from the National Death Index.

Results: Median diagnostic testing and consultation costs were the same ($P = .35$) in the standard Medicare population (\$643) and the HMO population (\$619), although the use of specific tests differed. More cardiovascular syncope was identified in the Medicare population (23% vs 18%; $P = .02$).

Inpatient, 30-day, 1-year, and 4-year mortality rates were higher in the Medicare population (1.7%, 3.8%, 16.7%, and 50.6% respectively) than in the HMO population (0.7%, 1.5%, 13.2%, and 41.8%). After adjusting for age, gender, comorbidity, diagnostic testing, and administrative factors, the relative risk (RR) of dying was lower for group-model HMO patients (RR = 0.74; 95% confidence interval = 0.60, 0.91) than for standard Medicare patients (RR = 1.0).

Conclusions: The inpatient management of these elderly patients with syncope was similar in the group-model HMO and standard Medicare settings, but survival was better for the individuals in the HMO. The reason for the differential survival is not obvious and warrants additional study.

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The inpatient evaluation of patients with syncope has been described many times in the last 2 decades.¹⁻⁶ Diagnostic strategies can be quite variable, and as many as 47% of individuals²⁻⁷ do not have a diagnosis established. Until a recent consensus conference, there have been no evidence-based guidelines to direct clinicians in caring for these patients.^{8,9} As healthcare delivery in the United States undergoes rapid change, there is interest in the impact of different delivery systems on the process of care and on clinical outcomes.¹⁰⁻¹⁴ Incentives for providing care may differ between healthcare systems, and the management of a syndrome like syncope, with no definitive algorithm for evaluation, could be particularly affected by these different incentives.

In Oregon, we identified 2 distinct models of healthcare delivery for elderly patients: a group-

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model health maintenance organization (HMO) and a standard Medicare fee-for-service system. The group-model HMO provides coordinated prepaid care delivered in HMO facilities to more than 400,000 Oregonians, including almost 50,000 individuals over the age of 65 years. With the exclusion of the group-model HMO patients, the 430,000 Medicare beneficiaries in Oregon are mainly treated in a fee-for-service system, although some are enrolled in other risk contracts. Among the Medicare patients, only the group-model HMO provides standardized healthcare coordination. We hoped that a comparison of the management of syncope in these 2 systems (group-model HMO and Medicare fee-for-service) would provide insight into the impact that different healthcare delivery models have on both process and outcome for this common condition. The aims of this analysis were to determine (1) whether these 2 healthcare delivery systems evaluated elderly patients with syncope differently and (2) whether differences in initial evaluation led to differential survival for those individuals.

...METHODS ...

Study Design and Patient Populations

Using an observational cohort design, we selected 2 healthcare delivery organizations serving elderly patients in Oregon: a group-model HMO and Medicare. The group-model HMO is based in the Portland metropolitan area and provides care coordinated by primary care physicians in HMO facilities. Medicare in Oregon encompasses patients admitted to hospitals throughout the state and includes treatment in a fee-for-service model, at the group-model HMO, and through other risk contracts. We reviewed the hospitalization databases of these 2 organizations from January 1, 1992, through December 31, 1994, identifying patients with *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) code 780.2 (syncope and collapse) as an admission diagnosis or as one of the discharge diagnoses. To ensure comparable populations, we only included individuals 65 years of age or older at the time of admission. The first admission in the time frame for a patient was selected; subsequent admissions were excluded. Within the Medicare population, we removed the admissions to the group-model HMO's hospitals, leaving a cohort of Medicare patients who were primarily cared for in a fee-for-service model (estimated at more than 90%). Our analyses include all these remaining Medicare patients,

because determining the presence or absence of a risk contract was not deemed reliable. As a convenience sample for chart review, we selected all of the HMO records and a 10% random sample of the Medicare patients. The patient population is a subset of a larger population that we reported on previously.¹⁵ The study was approved by institutional review boards at each participating institution.

Eligibility Reviews

Medical records were reviewed by 1 individual (WSG). The inclusion criterion was a documented syncopal event that occurred before admission to the hospital. We defined syncope as a transient loss of consciousness that resolved spontaneously.¹ Exclusion criteria were cardiac arrest or a persistently altered level of consciousness. For individuals transferred to another hospital during their admission, both hospitals' records were reviewed and treated as 1 hospitalization (all records were available). After initial review, 11% of patients were excluded, primarily because there was no documented syncopal event.

Chart Reviews

All inpatient records from each syncope admission were reviewed in detail. The clinical conditions in the Charlson Comorbidity Index¹⁶ were recorded. For other clinical diagnoses, standard definitions were used. New findings identified during the admission were recorded separately from preexisting conditions. We recorded the number of different types of physicians caring for each patient. Diagnostic test use was documented; however, test results were recorded only for left ventricular systolic function measurements. Interventions such as pacemaker placement or cardioversion also were recorded. Physician, nursing, and social work notes were used to determine where patients lived before admission and at discharge.

The etiology of the syncopal event was defined as that stated by the primary physician and was later categorized as cardiovascular, noncardiovascular, or unexplained using the definitions of Kapoor et al.² Occasionally, chart review led us to consider an alternative diagnosis to the 1 listed by the primary treating physician; however, we felt that overruling the clinician's diagnoses could be misleading since the diagnosis of a syncopal event relies heavily on history and physical examination findings^{1,2,5,8} that may not have been accurately documented in the record.

To test the reliability of data collection, 5% of these records were blindly rereviewed by a second

individual. Weighted kappa scores between the 2 reviewers for Charlson comorbidities, tests and therapies, and etiology of syncope were 0.74, 0.78, and 0.90 respectively. A kappa score above 0.75 indicates excellent reliability.¹⁷

Outcomes

The costs of diagnostic tests were combined using 1997 Medicare relative value units (RVUs) into a total cost for diagnostic testing for each individual.¹⁸ The cost for each different physician involved in a patient's care was defined as the RVU-allowable charge for a new patient comprehensive visit. Total resource use for each patient with syncope was defined as the total cost of diagnostic testing plus the total cost of these new patient comprehensive visits.

The primary outcome of the study was all-cause mortality. All names and social security numbers were submitted to the National Death Index to match with deaths through December 31, 1996. This index is 99.9% specific and 97% sensitive when the social security number is available.¹⁹ Partial matches all were explicitly reviewed. Individuals not identified in the National Death Index were assumed to have been alive on December 31, 1996, and their survival time was censored on that date.

Statistical Analysis

Statistical testing was performed using SPSS version 7.5 (SPSS Inc, Chicago, IL). The Mann-Whitney test was used to compare continuous variables not distributed normally. The χ^2 test was used to compare dichotomous variables.¹⁷ Survival curves were estimated using the method of Kaplan and Meier²⁰ and compared using the log-rank test. All tests of hypotheses were considered significant when 2-sided probability values were $<.05$.

Cox proportional hazards analysis²¹ was used to evaluate survival after hospital discharge according to the healthcare system, adjusting for age, comorbidity, and other prognostic factors. Since all of the prognostic factors after a syncopal event are

not well established, we used a hierarchical model where the first block included age, gender, comorbidity index, healthcare system, and etiology of syncope. Multiple variations of age and comorbidity were tested using likelihood ratios to determine the best fit. Age was entered into the model as both age and age-squared. Comorbidities were combined into the Charlson Comorbidity Index¹⁶ and grouped into 4 categories (0, 1-2, 3-4, 5 or more) for use as an ordinal variable. Other candidate variables were tested in univariate fashion against mortality using Kaplan-Meier survival estimates and the log-rank test. Variables reaching significance at $P \leq .20$ were included in the second block using forward stepwise regression, requiring $P \leq .05$ for entry. In addition to those previously mentioned, the variables in the final model included aortic stenosis, congestive heart failure, prior myocardial infarction, left ventricular systolic function, active medical problems (malignancy, dehydration, traumatic injury), pres-

Table 1. Demographic Characteristics

	HMO	Medicare	P*
N	583	473	
Age in years			
(median)	78	79	.02
(25th, 75th percentile)	73, 83	74, 85	
85 years or older	20.9%	26.4%	
Female	55.6%	53.9%	.59
Non-Hispanic white	95.7%	98.5%	.008
Prior to admission, patient was living:			
Independently	88.2%	88.2%	.40
Assisted-care facility	11.1%	10.1%	
Nursing Home	0.7%	1.5%	
Unknown	NA	0.2%	
Site of admission:			
Emergency room	87.8%	88.4%	.78
Clinic visit	7.9%	9.1%	
Other	4.3%	2.5%	
Home in the Portland metropolitan area	88.3%	36.4%	<.001
Distance from home address to hospital:			
Within 15 miles	81.0%	83.1%	.44
Between 15 and 50 miles	16.6%	14.0%	
More than 50 miles	2.4%	3.0%	

* P values derived from Mann-Whitney for continuous variables and chi square for categorical variables.

ence of neurologist, diagnostic testing, length of stay, and discharge to assisted-care facility or nursing home. We tested multiple variables for interactions with age, sex, and healthcare system. No interactions reached significance in the multivariate model, including age by health system. In post hoc analyses, we examined the impact of adding proposed explanatory factors (internal medicine physician, antiarrhythmic drugs, hospital type, rural location) to the model.

...RESULTS ...

Demographics and Comorbidity

Over the 3-year period, 583 individuals over the age of 65 were admitted to the HMO with syncope; and 4753 were admitted to non-HMO Medicare hospitals, of whom 473 were sampled. The median

age of the Medicare patients was slightly higher ($P = .016$) than that of the HMO patients (Table 1), and the Medicare population was skewed toward the very old (85 years or older). Individuals at the HMO were more likely to represent ethnic minorities and were primarily drawn from the Portland metropolitan area. Almost all patients in both systems were living at home before admission (88%), and most were admitted through the emergency room (88%). Rarely (3%) were patients admitted to a hospital more than 50 miles from their home.

Cardiac disease was common (Table 2), but was represented equally in both systems. The only significantly different comorbid medical condition was hypertension, documented in 53% of the HMO patients compared with 43% of the Medicare patients. Syncope before the index event was recorded in one fifth of patients. The Charlson Comorbidity Index scores were distributed equally among both groups. The mean (3.53 days) and median (3 days) lengths of stay were identical in each system.

Table 2. Preexisting Medical Conditions

	HMO (%)	Medicare (%)
Cardiovascular disease		
Hypertension*	53.2	43.3
Coronary artery disease	37.0	32.8
Cerebrovascular disease	23.5	22.2
Congestive heart failure	19.2	17.3
Prior myocardial infarction	18.0	14.4
Peripheral vascular disease	7.0	7.6
Aortic stenosis	5.8	5.7
Hypertrophic cardiomyopathy	0.3	0.4
Arrhythmias		
Atrial fibrillation/flutter	20.1	20.7
Sinus bradycardia	8.2	7.8
Supraventricular tachycardia	4.5	4.7
Prior pacemaker	4.1	4.7
Ventricular tachycardia	2.1	3.0
Complete heart block	1.9	1.1
Prior sudden cardiac death	1.0	1.1
Other comorbid disease		
Prior syncope	18.5	20.9
Diabetes	15.4	14.0
Any tumor	13.6	13.5
Dementia	11.1	12.3
Charlson Comorbidity Index [†]		
Index = 0	30.0	27.3
Index = 1 or 2	44.8	48.8
Index = 3 or 4	19.6	17.5
Index = 5 or more	5.7	6.3

* $P < .01$.

[†] $P = .50$ by chi square for the differences in the comorbidity index distribution.

Inpatient Management

Patients at the HMO were more likely to have an internal medicine physician involved in their care than patients at the Medicare hospitals (85% vs 59%; $P < .001$), and were less likely to be seen by a family or general practitioner (13% vs 25%; $P < .001$). Cardiologists (29%) and neurologists (9%) were consulted equally in the 2 systems. There was a trend toward more physicians providing care for HMO patients (mean number of physicians 1.6 vs 1.5; $P = .11$).

A 12-lead electrocardiogram and telemetry monitoring were used more often at the HMO, as was exercise testing (Table 3). However, many tests were less likely to be performed at the HMO, including Holter monitoring, tilt table testing, echocardiography, electrophysiology testing, carotid ultrasonography, and electroencephalography. There was a trend toward less diagnostic testing at the HMO than at the Medicare hospitals (median costs \$356 vs \$397; $P = .053$), but the combined use of diagnostic testing and consultations was equal in both systems, as measured by median costs

(\$619 vs \$643; $P = .348$) or by average costs (\$785 vs \$795; $P = .812$) (Figure 1).

There were no significant differences in the major cardiac therapies provided in the different systems (Figure 2). The most common intervention was permanent pacemaker placement (6%); other interventions, including valve replacement, bypass surgery, and angioplasty, were performed in fewer than 1% of the patients. No patient in either system received an implantable defibrillator. Most minor interventions, both cardiac and non-cardiac, were provided equally in both systems. Exceptions included starting class 1 antiarrhythmic agents, used less often in the HMO than in Medicare fee-for-service (0.9% vs 4.9%; $P < .001$), and cardioversion, which was also used less often in the HMO (0% vs 1.5%; $P = .006$).

Etiology of Syncopal Events

Specific etiologies (Table 4) of syncopal events were assigned more often in Medicare patients (64.2% vs 56.6%; $P = .021$). Cardiovascular causes of syncope were assigned in 17.5% of HMO admissions, and noncardiovascular causes were found in 39.1%. The remaining 43.4% of individuals was discharged without an identified etiology for their syncopal event. Among the Medicare patients, cardiovascular causes were assigned in 22.6% and noncardiovascular causes in 41.6% of cases; only 35.7% of patients were discharged without a diagnosis for the syncopal event.

Survival

The minimum follow-up time after hospital discharge was 2 years with a maximum of 5 years, and it was similar in each system. The expected 4-year mortality for this population (adjusted for age and gender²²) was 27.9%, but we observed an estimated 4-year mortality of $45.8\% \pm 1.9\%$, 64% higher than expected.

The estimated mortality as an inpatient, at 30 days after discharge, at 1 year after discharge, and at 4 years after discharge was lower for patients in

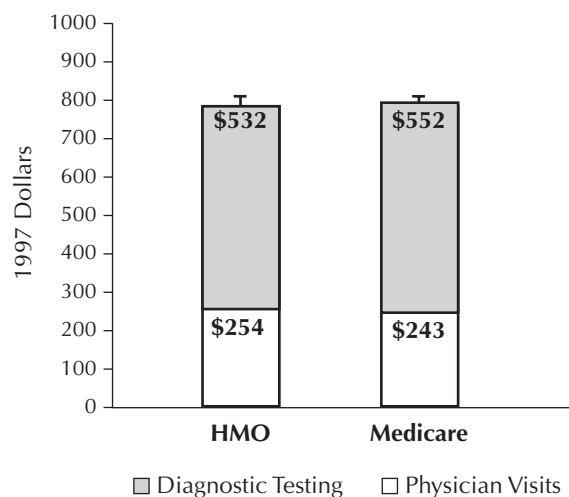
Table 3. Diagnostic Testing During the Admission

	HMO (%)	Medicare (%)
Standard cardiac testing		
12-Lead electrocardiogram (ECG)*	99.0	95.6
Telemetry monitoring*	93.8	86.7
Exercise test*	4.8	1.3
Holter monitoring	0.2	3.8
Tilt table†	0.2	1.5
Signal-averaged ECG	0.2	1.3
Advanced cardiac testing		
Echocardiogram*	11.7	19.7
Cardiac catheterization	3.8	1.9
Stress thallium	1.2	2.7
Electrophysiology Study†	0.5	2.3
Neurologic testing		
Computed tomography: head	16.6	19.7
Electroencephalogram†	7.7	11.4
Carotid ultrasound†	6.9	11.2
Magnetic resonance imaging of brain	1.0	1.7
Lumbar puncture	0.5	0.8
Other potentially related testing		
Ventilation-perfusion scan	2.4	1.5
Lower extremity venous doppler	0.7	1.5
Pulmonary function tests	0.7	1.1
Abdominal ultrasound	4.3	4.2

* $P < .01$.

† $P < .05$.

Figure 1. Inpatient Costs for the Diagnostic Evaluation of Syncope



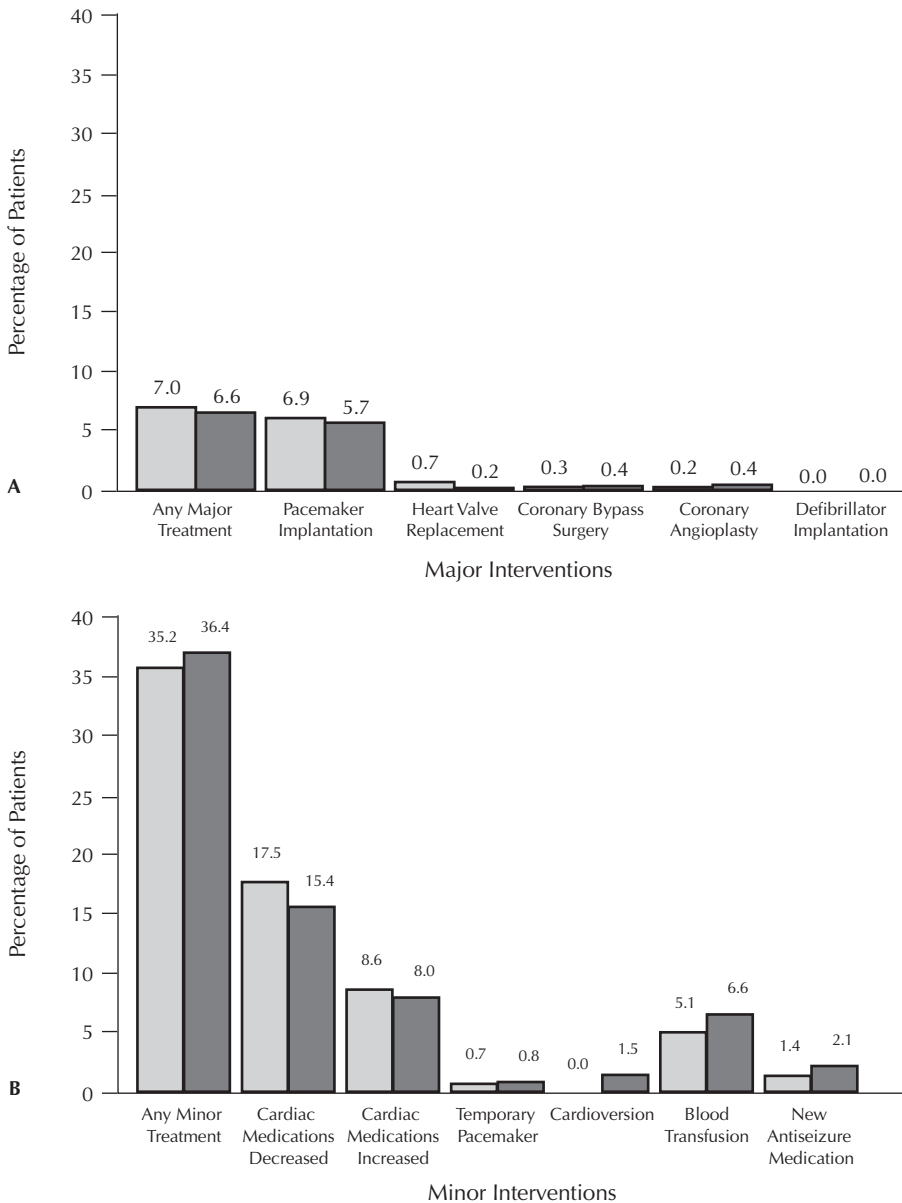
Average diagnostic testing costs, physician consultation costs, and combined costs of the diagnostic evaluation for individuals with syncope in the 2 healthcare systems are similar. Error bars denote the standard error of the mean for the combined average costs in each healthcare system.

the group-model HMO than patients in the standard Medicare population, and the survival curves differed significantly ($P = .010$; Figure 3). The unadjusted mortality in the HMO patients was $0.7\% \pm$

0.3% , $1.5\% \pm 0.5\%$, $13.2\% \pm 1.4\%$, and $41.8\% \pm 2.5\%$ at the previously mentioned time periods, while the unadjusted mortality for the same time periods in the Medicare population was $1.7\% \pm 0.6\%$, $3.8\% \pm 0.9\%$, $16.7\% \pm 1.7\%$, and $50.6\% \pm 2.8\%$. The unadjusted relative risk of dying over the 5 years of follow-up in the HMO population was 0.79 (95% confidence interval [CI] = 0.65, 0.96) compared with the Medicare population.

To adjust for the small baseline differences we observed, a multivariate Cox proportional hazards model of survival after hospital discharge was used. In addition to age, gender, and comorbidity, we adjusted for left ventricular systolic function, congestive heart failure, aortic stenosis, prior myocardial infarction, diagnostic testing and consultations, length of stay, etiology of syncope, other active medical problems besides syncope, and discharge to assisted-care facility or nursing home. After adjusting for these variables, the healthcare system remained a significant predictor of mortality ($P = .005$). Compared with patients in the standard Medicare population, patients in the HMO had a 26% reduced risk of dying (relative risk = 0.74; 95% CI = 0.60, 0.91). The adjusted survival curves (Figure 4) are quite similar to the unadjusted survival curves. As a test of our age adjustment, we ran a second model using age as a categorical vari-

Figure 2. Therapeutic Interventions During the Hospitalization



Panel A depicts major interventions provided during the syncope admission and reveals no significant treatment differences between the 2 healthcare systems. Panel B depicts minor interventions; only the rate of cardioversion differed significantly between the group-model HMO and the standard Medicare population ($P = .006$).

able: 65 to 74 years, 75 to 84 years, and 85 or more years of age. The effects of the HMO were unchanged (relative risk = 0.74; 95% CI = 0.61, 0.91). In post hoc analyses, the presence of an internist, the use of class 1 antiarrhythmic agents, the hospital type, and the patient's residence (Portland metropolitan area vs other) were not significant predictors of mortality in the multivariate model, nor did they change the impact of the healthcare system.

...DISCUSSION ...

Within this large cohort of elderly patients hospitalized with syncope, the mortality rate during the 4 years after discharge was considerably higher than expected. The inpatient management of syncope was not substantially different in the 2 healthcare systems; yet both short-term and long-term survival was better among patients cared for in the group-model HMO compared with the Medicare hospitals. After controlling for multiple potentially confounding factors, individuals evaluated for syncope at the group-model HMO had a 26% reduced risk of dying compared with the Medicare population. The reason for the improved survival is not obvious and is not easily explained by the inpatient data collected in this study.

One possibility for the different survival experience of the 2 groups is that the patients in the healthcare systems were not randomly assigned, and thus represent different populations. An elderly individual's decision to join an HMO is not random and is subject to selection bias. Furthermore, some of the determinants^{14,23-25} of why individuals enroll (or disenroll) in an HMO could independently affect survival. Another reason why our 2 cohorts may not be equivalent is that not every patient with syncope is admitted to the hospital.^{2,4,6} If the standard for admitting a patient with syncope in the 2 systems differed substantially, then the inpatients with

syncope may have differed. Our study provides no information on the diagnostic evaluation and subsequent survival of individuals with syncope who were not admitted; hence, we cannot define the threshold for admission in the 2 health systems. However, if there were a difference, we would expect the HMO to have a higher threshold for admission; thus, the hospitalized HMO patients would be sicker and have worse short-term and long-term survival. This is in direct contrast to our findings and only strengthens our conclusion. Ultimately, the similarities of the baseline demographics and comorbid medical condi-

Table 4. Etiology of Syncopal Event

	HMO (%)	Medicare (%)
Cardiovascular syncope*	17.5	22.6
Bradycardia	9.8	7.8
Unspecified	4.3	3.0
Complete heart block	3.1	2.1
Sick sinus syndrome	1.4	2.5
Second degree heart block: Mobitz 2	1.0	0.2
Tachycardia	2.1	5.7
Ventricular tachycardia	1.4	2.7
Supraventricular tachycardia	0.7	3.0
Other arrhythmias	1.7	5.3
Atrial fibrillation	1.4	3.8
Unsuspected arrhythmia	0.3	1.3
Pacemaker dysfunction	0.0	0.2
Obstructive	1.7	1.3
Aortic stenosis	0.9	0.8
Pulmonary embolus	0.9	0.4
Other	2.2	2.5
Noncardiovascular syncope	39.1	41.6
Vasoactive	20.2	9.1
Vagal episode	15.3	7.2
Medications	5.0	1.9
Volume	10.6	19.5
Orthostatic or dehydration	9.4	15.0
Bleeding or anemia	1.2	4.5
Neurologic	3.9	5.5
Seizure	1.5	2.3
Cerebrovascular accident	1.2	1.1
Transient ischemic attack	1.0	1.1
Other neurologic disease	0.2	1.1
Other	4.3	7.6
Unexplained syncope	43.4	35.7

*Overall P value = .021 from chi square for difference between health systems for etiologies of syncope.

tions suggest that our 2 populations of patients with syncope are comparable.

As is the case in all nonrandomized studies, inadequate adjustment for unmeasured confounders and baseline differences may have created an illusory difference in survival. Our analysis cannot control for unmeasured factors (such as socioeconomic status); however, the demographic profiles of both the HMO and the Medicare populations were remarkably well matched, with the exception of small differences in age, ethnicity, prior hypertension, and rural admissions. Consequently, the unadjusted relative risk of dying (0.79) was quite similar to the adjusted relative risk (0.74), using both methods of age adjustment. On the other hand, reliance on documented medical conditions to assess comorbidity, which may have been more rigorously recorded in the HMO, could bias the results, and lead us to "overadjust" for illness in the HMO. Truly avoiding this bias would require a prospective study, and it seems unlikely to explain a 26% reduction in mortality.

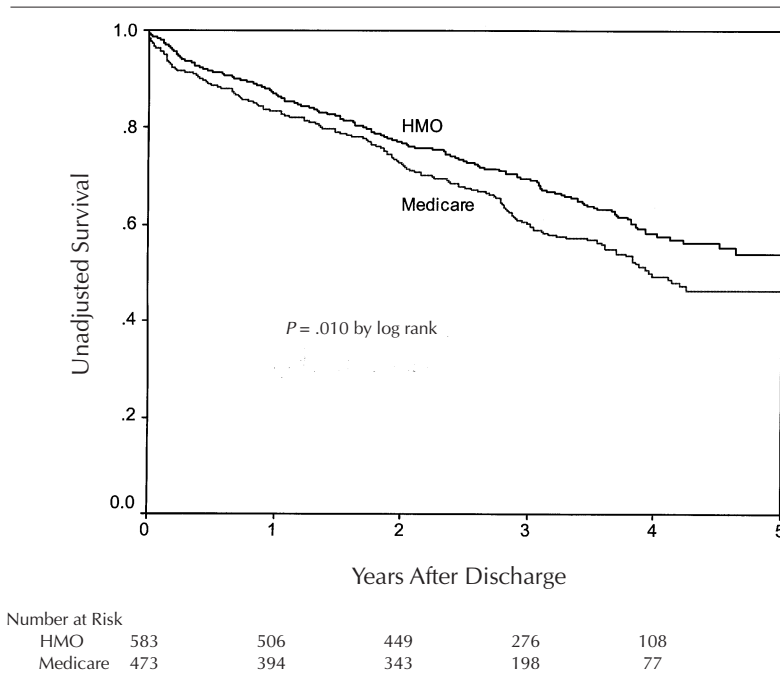
Reviewing the inpatient management of these elderly individuals with syncope suggests some potential causes for differential survival in relation to physician providers. The presence of a primary care provider for virtually all admissions at the HMO (98% compared with 84% at the Medicare hospitals) may have resulted in better care coordination. Additionally, most of the primary care providers at the HMO were internal medicine physicians. It is possible that these elderly individuals with syncope (and many other medical problems) benefited from a careful evaluation by their own primary care provider, a benefit that is difficult to deduce or quantify during a retrospective record review. However, prior reports on the impact of primary care coordination and provider characteristics are not uniformly positive,²⁶⁻³¹ and the presence of an internist in our study was not significantly related to mortality in the multivariate model. A second interesting finding with respect to physicians was the trend toward more physician evaluations among HMO patients,

contradicting popular wisdom that HMOs limit referrals to specialists.^{10-14,25,32-33} Again, it is not clear how this finding could have directly improved survival since both populations received similar interventions.

One possible therapeutic explanation for some of the difference in survival is the 5-fold increase in the use of class 1 antiarrhythmic agents in the Medicare population, since some of these agents have been associated with excess mortality.³⁴ However, these drugs were not a predictor of mortality in the multivariate model and were used in less than 5% of the Medicare population. The greater use of class 1 antiarrhythmic agents in the Medicare patients parallels the increased use of Holter monitoring and the increased incidence of tachycardic etiologies of syncope. Thus, these drugs may have been used appropriately for a clinical indication, and it is doubtful that they account for the survival differences we observed.

Reassuringly, provision of major interventions did not differ by system, in part because patients with syncope present infrequent opportunities for significant therapeutic intervention. Permanent pacemakers

Figure 3. Unadjusted Survival After an Admission for Syncope



Survival curves are shown for patients hospitalized with syncope between 1992 and 1994 in Oregon (n = 1056). The curves differ significantly between individuals in the group-model HMO and individuals in the standard Medicare system; $P = .010$ by the log-rank test.

were implanted in only 6% of the population, and the most common therapeutic remedy by far was medication adjustment. Thus, we were unable to identify any one curative factor that accounted for the improved survival among syncope patients at the HMO in our study. One may speculate that for elderly patients with syncope, a careful evaluation by a primary care physician, universal arrhythmia monitoring, judicious use of antiarrhythmic medications, and meticulous attention to the patient's current medication profile may interact to provide improved survival. Measuring that type of multifactorial effect is beyond the scope of this study, but may be a promising area for investigation in the future.

Previously published data on the effects of HMO care on outcome have been mixed. Improved short-term mortality was seen in HMO patients compared with fee-for-service patients in a population of individuals referred for bypass surgery.³⁵ In a different study, 1 geographic area's HMO patients had a 10-year adjusted risk ratio for breast cancer death of 0.78 compared with a fee-for-service population, while a different geographic area had no difference.³⁶ Similarly, no differences in outcome between HMO and fee-for-service health systems were found in individuals with strokes,³⁷ nor in individuals with myocardial infarction.³⁸ In contrast, for patients with a variety of diseases, worse health outcomes were found in the HMO for selected subgroups (the poor and the elderly).³⁹

In summary, there is no consensus for which model of healthcare delivery provides the best outcomes, and obviously not all HMOs are equal. The results of this study must be considered in that context, but our findings support the view that, for elderly patients with syncope, this HMO's care may have enhanced health outcomes.

With regard to the process of care, we noted equivalent use of diagnostic tests and consultations for patients with syncope in the 2 distinct healthcare systems. There was no rationing of diagnostic resources in the group-model HMO, nor financially driven overtesting in the standard Medicare system. We cannot exclude the possibility that there were significant differences in diagnostic testing after discharge because we only reviewed the management during the admission. However, we would sup-

pose that the HMO would provide fewer services on an inpatient basis (and more services after discharge), thus lending additional support to our observation that financial incentives did not guide the inpatient management of these patients.

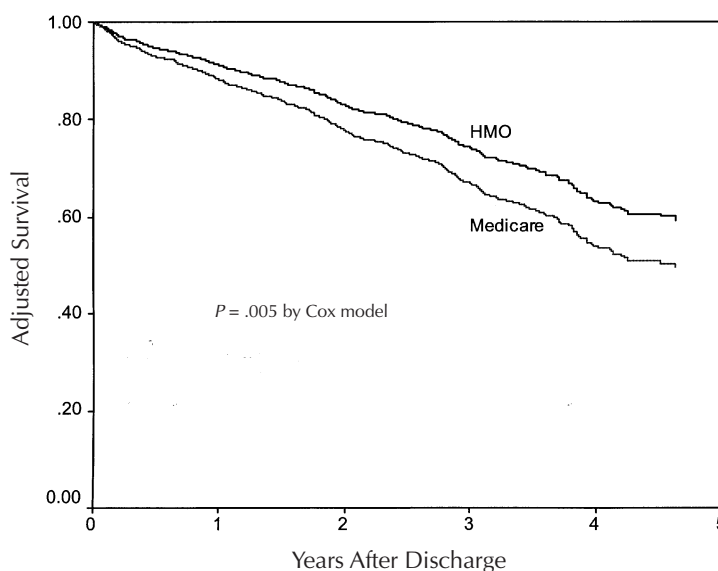
... CONCLUSION ...

Despite minor differences in the management of individuals hospitalized with syncope in different healthcare systems, survival was better for elderly patients in the group-model HMO than for patients in the standard Medicare system. The mechanism of the survival advantage is not clear, but is likely to be multifactorial. More research into the benefits of primary care coordination for hospitalized elderly patients with syncope seems warranted.

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Figure 4. Adjusted Survival After an Admission for Syncope



Survival for individuals in the group-model HMO remains significantly better than survival for individuals in the standard Medicare system after adjusting for age, gender, comorbid illness, and other prognostic factors using a proportional hazards model.

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... REFERENCES ...

1. Kapoor WN. Evaluation and management of the patient with syncope. *JAMA* 1992;268:2553-2560.
2. Kapoor WN, Karpf M, Wieand S, Peterson JR, Levey GS. A prospective evaluation and follow-up of patients with syncope. *N Engl J Med* 1983;309:197-204.
3. Silverstein MD, Singer DE, Mulley AG, Thibault GE, Barnett GO. Patients with syncope admitted to medical intensive care units. *JAMA* 1982;248:1185-1189.
4. Day SC, Cook EF, Funkenstein H, Goldman L. Evaluation and outcome of emergency room patients with transient loss of consciousness. *Am J Med* 1982;73:15-23.
5. Eagle KA, Black HR. The impact of diagnostic tests in evaluating patients with syncope. *Yale J Biol Med* 1983;56:1-8.
6. Martin GJ, Adams SL, Martin HG, Mathews J, Zull D, Scanlon PJ. Prospective evaluation of syncope. *Ann Emerg Med* 1984;13:499-504.
7. Kapoor WN. Evaluation and outcomes of patients with syncope. *Medicine* 1990;69:160-175.
8. Linzer M, Yang EH, Estes NAM, Wang P, Vorperian VR, Kapoor WN. Diagnosing syncope, part 1: Value of history, physical examination, and electrocardiography. *Ann Intern Med* 1997;126:989-996.
9. Linzer M, Yang EH, Estes NAM, Wang P, Vorperian VR, Kapoor WN. Diagnosing syncope, part 2: Unexplained syncope. *Ann Intern Med* 1997;127:76-86.
10. Bodenheimer T. HMO backlash—righteous or reactionary? *N Engl J Med* 1996;335:1601.
11. Church GJ. Backlash against HMOs. *Time*. April 14, 1997:149.
12. Gorman C. Singing the HMO blues. *Time*. July 13, 1998:152.
13. Miller RH, Luft HS. Managed care plan performance since 1980. A literature analysis. *JAMA* 1994;271:1512-1519.
14. Morgan RO, Virnig BA, DeVito CA, Persily NA. The Medicare-HMO revolving door—the healthy go in and the sick go out. *N Engl J Med* 1997;337:169-175.
15. Getchell WS, Larsen GC, Morris CD, McAnulty JH. The etiology of syncope and long-term survival in hospitalized patients with syncope. *J Gen Intern Med* 1999;14:677-687.
16. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chronic Dis* 1987;50:373-383.
17. Fleiss JL. *Statistical Methods for Rates and Proportions*, 2nd ed. New York, NY: John Wiley and Sons; 1981.
18. *Fed Regist*. November 22, 1996;61:59490-59724.
19. Calle EE, Terrell DD. Utility of the National Death Index for ascertainment of mortality among Cancer Prevention Study II participants. *Am J Epidemiol* 1993;137:235-241.
20. Kaplan EL, Meier P. Nonparametric estimation from incomplete observations. *J Am Stat Assoc* 1958;53:457-481.
21. Cox DR. Regression models and life tables (with discussion). *J R Stat Soc* 1972;34:187-220.
22. Anderson RN, Kochanek KD, Murphy SL. Report of final mortality statistics, 1995. *Mon Vital Stat Rep* 1997;45:1-80.
23. Taylor AK, Bearegard KM, Vistnes JP. Who belongs to HMOs: A comparison of fee-for-service versus HMO enrollees. *Med Care Res Rev* 1995;52:389-408.
24. Hellinger FJ. Selection bias in HMOs and PPOs: A review of the evidence. *Inquiry* 1995;21:135-142.
25. Newcomer R, Preston S, Harrington C. Health plan satisfaction and risk of disenrollment among social/HMO and fee-for-service recipients. *Inquiry* 1996;33:144-154.
26. Wholey DR, Burns LR, Lavizzo-Mourey R. Managed care and the delivery of primary care to the elderly and the chronically ill. *Health Serv Res* 1998;33:322-353.
27. Reuben DB, Borok GM, Wolde-Tsadiq G, et al. A randomized trial of comprehensive geriatric assessment in the care of hospitalized patients. *N Engl J Med* 1995;332:1345-1350.
28. Franks P, Fiscella K. Primary care physicians and specialists as personal physicians. Health care expenditures and mortality experience. *J Fam Pract* 1998;47:105-109.
29. Whittle J, Lin CJ, Lave JR, et al. Relationship of provider characteristics to outcomes, process, and costs of care for community-acquired pneumonia. *Med Care* 1998;36:977-987.
30. Schreiber TL, Elkhatib A, Grines CL, O'Neill WW. Cardiologist versus internist management of patients with unstable angina: Treatment patterns and outcomes. *J Am Coll Cardiol* 1995;26:577-583.
31. Donohue MT. Comparing generalist and specialty care: Discrepancies, deficiencies, and excesses. *Arch Intern Med* 1998;158:1596-1608.
32. Clancy CM, Franks P. Utilization of specialty and primary care: The impact of HMO insurance and patient-related factors. *J Fam Pract* 1997;45:500-508.
33. Cooper PF, Nichols LM, Taylor AK. Patient choice of physician: Do health insurance and physician characteristics matter? *Inquiry* 1996;33:237-246.
34. Echt DS, Liebson PR, Mitchell LB, et al. Mortality and morbidity in patients receiving encainide, flecainide, or placebo. The Cardiac Arrhythmia Suppression Trial. *N Engl J Med* 1991;324:781-788.
35. Starr A, Furnary AP, Grunkemeier GL, He GW, Ahmad A. Is referral source a risk factor for coronary surgery? Health maintenance organization versus fee-for-service system. *J Cardiovasc Surg* 1996;111:708-716.
36. Potosky AL, Merrill RM, Riley GF, et al. Breast cancer survival and treatment in health maintenance organizations and fee-for-service settings. *J Natl Cancer Inst* 1997;89:1683-1691.
37. Retchin SM, Brown RS, Yeh SC, Chu D, Moreno L. Outcomes of stroke patients in Medicare fee-for-service and managed care. *JAMA* 1997;278:119-124.
38. Every NR, Fihn SD, Maynard C, Martin JS, Weaver WD. Resource utilization in treatment of acute myocardial infarction: Staff model health maintenance organization versus fee-for-service hospitals. The MITI Investigators. *J Am Coll Cardiol* 1995;26:401-406.
39. Ware JE Jr, Bayliss MS, Rogers WH, Kosinski M, Tarlov AR. Differences in 4-year health outcomes for elderly and poor, chronically ill patients treated in HMO and fee-for-service systems. Results from the Medical Outcomes Study. *JAMA*