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A Comparison of Functional Outcomes after Hip Fracture in Group/Staff HMOs and Fee-for-Service Systems

CONTEXT. Previous studies examining differences in the quality of care between capitated and fee-for-service payment systems have focused on the care delivered in a single setting. No study to date has compared outcomes over an entire episode of care delivered across multiple settings.

OBJECTIVE. To compare outcomes of care for patients receiving institutional rehabilitation for hip fracture in fee-for-service and group/staff HMO delivery systems.

DESIGN. One-year prospective inception cohort.

SETTING. Six hospital-based, integrated care systems paid on a traditional fee-for-service model and five group/staff HMOs (paid fixed capitation rate by Medicare). The 11 delivery systems were selected because of their commitment to geriatric rehabilitation.

PATIENTS. 196 fee-for-service and 140 group/staff HMO patients with acute hip fracture were identified on admission to inpatient rehabilitation.

MEASURES. Four primary outcomes—recovery of activities of daily living, improvement in ambulation, return to community living, and mortality—were measured at 3, 6, 9, and 12 months. Service utilization was assessed in the acute-care hospital setting, rehabilitation setting, and at each 3-month follow-up interval. Risk adjustment was performed by using multiple and logistic regression.

RESULTS. Overall, no differences were found between patients in group/staff HMOs and fee-for-service patients. Group/staff HMO patients experienced improved functional recovery at 6 months ($P < 0.01$) and improved ambulation at 12 months ($P = 0.05$) compared with fee-for-service patients, although these were isolated findings. With regard to utilization, group/staff HMO delivery systems used physician services less intensively and substituted less-skilled allied health personnel.

CONCLUSION. Compared with fee-for-service delivery systems, with a similar commitment to excellence in geriatric rehabilitation, group/staff HMOs can achieve equivalent outcomes in older patients recovering from hip fracture with less-intense service utilization.

With the growing number of older adults in Medicare managed care,¹ much debate has centered on whether the quality of care under this capitated payment structure differs from care delivered under fee-for-service. Comparative studies conducted over the past decade suggest that the quality of care in HMOs is at least as good as that in fee-for-service care.²⁻¹¹ These previous studies, however, have primarily focused on care delivered in a single setting (i.e., acute-care in the hospital,

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ambulatory care, or home care) or on a specific aspect of care (i.e., preventive services or a particular chronic disease). Yet older patients, particularly those with complex care needs, frequently require medical care delivered from multiple sites. Care fragmentation remains a serious threat to the quality of care that these patients receive. The ability of a delivery system to improve the health care outcomes of their older members across the continuum of care may be an even more sensitive measure of quality for comparison.

The care of older patients with hip fracture is ideal for comparing quality of care across multiple settings with different payment structures. With over 250,000 cases of hip fracture occurring per year,^{12,13} this condition is highly prevalent and has wide variations in outcomes of care. Following hip fracture, 50% to 70% of older patients do not regain their prefracture level of function,^{14,15} 46% to 79% do not regain their prefracture ability to ambulate,¹⁴⁻¹⁶ 35% to 50% do not return to community living,^{17,18} and 17% to 32% die within the year.¹⁹⁻²¹ Previous studies have demonstrated that the hospital care of patients with hip fracture is sensitive to the type of reimbursement structure under the implementation of diagnosis-related groups.²²⁻²⁶ Patients with hip fracture have a discrete beginning to their episode of care (the fracture) and require treatment from different disciplines²⁷ in multiple sites of care. Institutional rehabilitation for hip fracture is typically provided in Medicare-certified skilled nursing facilities (SNFs), although a few patients are admitted to inpatient rehabilitation facilities (RFs). Approximately 47% to 67% of all patients with hip fracture receive rehabilitation in one of these institutional settings—a subgroup comprising predominantly older, frailer patients with associated cognitive impairment and inadequate social support.^{28,29}

In this study, we compare quality of care for patients receiving institutional rehabilitation for hip fracture in group/staff HMO and fee-for-service delivery systems for the primary outcomes of recovery of function, improvement in ambulation, return to community living, and mortality. We hypothesized that although group/staff HMO and fee-for-service systems might differ in the type and intensity of service delivered, primary outcomes of care would be the same.

Methods

Settings

The six participating group/staff HMOs were selected on the basis of longstanding Medicare-risk contracts (greater than 10 years), the size of their Medicare-risk population, and an established commitment to geriatric rehabilitation. In the regions studied, three group/staff HMOs had 15,000 to 20,000 Medicare beneficiaries and

three had 45,000 or more Medicare beneficiaries. Medicare enrollment in these group/staff HMOs represented between 8% and 32% of total enrollment in each region. These systems were selected because they had reputable Medicare-risk programs for geriatric rehabilitation in RFs or SNFs that offered physician-directed interdisciplinary teams and/or nurse practitioner rounding.³⁰

For each group/staff HMO, we included the institutions to which they admitted most (greater than 90% overall) of their patients with hip fracture for rehabilitation under their Medicare-risk contract. Two group/staff HMOs used subacute-care SNFs that they owned and operated and that were located close to their other services (representing three facilities). Two group/staff HMOs contracted with community-based, proprietary SNFs. They established payment contracts for hip fracture rehabilitation that were not subject to the fee-for-service limits and had a close working relationship with group/staff HMO rehabilitation staff (five facilities total). One group/staff HMO contracted with a hospital-based SNF in which the rehabilitation staff were employed by the HMO. The final system was part owner/operator of both a freestanding RF and an SNF that was connected to their major acute-care hospital.

We also selected five vertically integrated fee-for-service delivery systems on the basis of size of the Medicare patient population, availability of both SNFs and RFs in their system, and similar geographic representation as the group/staff HMOs (West, Mountain, Midwest, and Northeast). These fee-for-service delivery systems also had a reputation for excellent geriatric care; were paid on a traditional fee-for-service model and through prearranged selective contracting; were organized to provide all of the essential components of care delivery, including the acute-care hospital, outpatient clinics, and/or attached physicians' offices; and had an available RF and SNF and access to home-based care. In each system, we selected the institutions to which they discharged most (greater than 90% overall) of their Medicare patients with hip fracture. In four of the five systems, this included a hospital-based RF and a hospital-based SNF unit (eight facilities). In the other system, this included a freestanding RF and an SNF attached to the RF (two sites).

All 11 delivery systems agreed to participate. The study was approved by the Human Subjects Review Committees at the University of Colorado as well as local review boards.

Patients

Potential participants undergoing rehabilitation for acute hip fracture were identified on admission to an RF

or SNF. Study inclusion criteria included age older than 64 years, English-speaking, Medicare or Medicare-risk coverage, acute-care hospital stay for hip fracture within the past 30 days, and no previous admission to a rehabilitation setting for this episode. Potential participants with hip fracture (e.g., femoral neck, intertrochanteric, subtrochanteric fractures) were identified on the basis of admission codes from The International Classification of Diseases, Ninth Revision, Clinical Modification (i.e., codes 820.0, 820.01, 820.02, 820.03, 820.09, 820.20, 820.21,

820.22, and 820.8) and confirmed by chart and radiograph review. Patients with cognitive impairment or aphasia to a degree that limited their ability to provide informed consent remained eligible provided that an appropriate proxy could be located. Patients who were receiving hospice care or who were comatose were excluded.

The recruitment experience is summarized in **Figure 1**. An estimated 1197 patients receiving institutional rehabilitation for hip fracture were screened, and

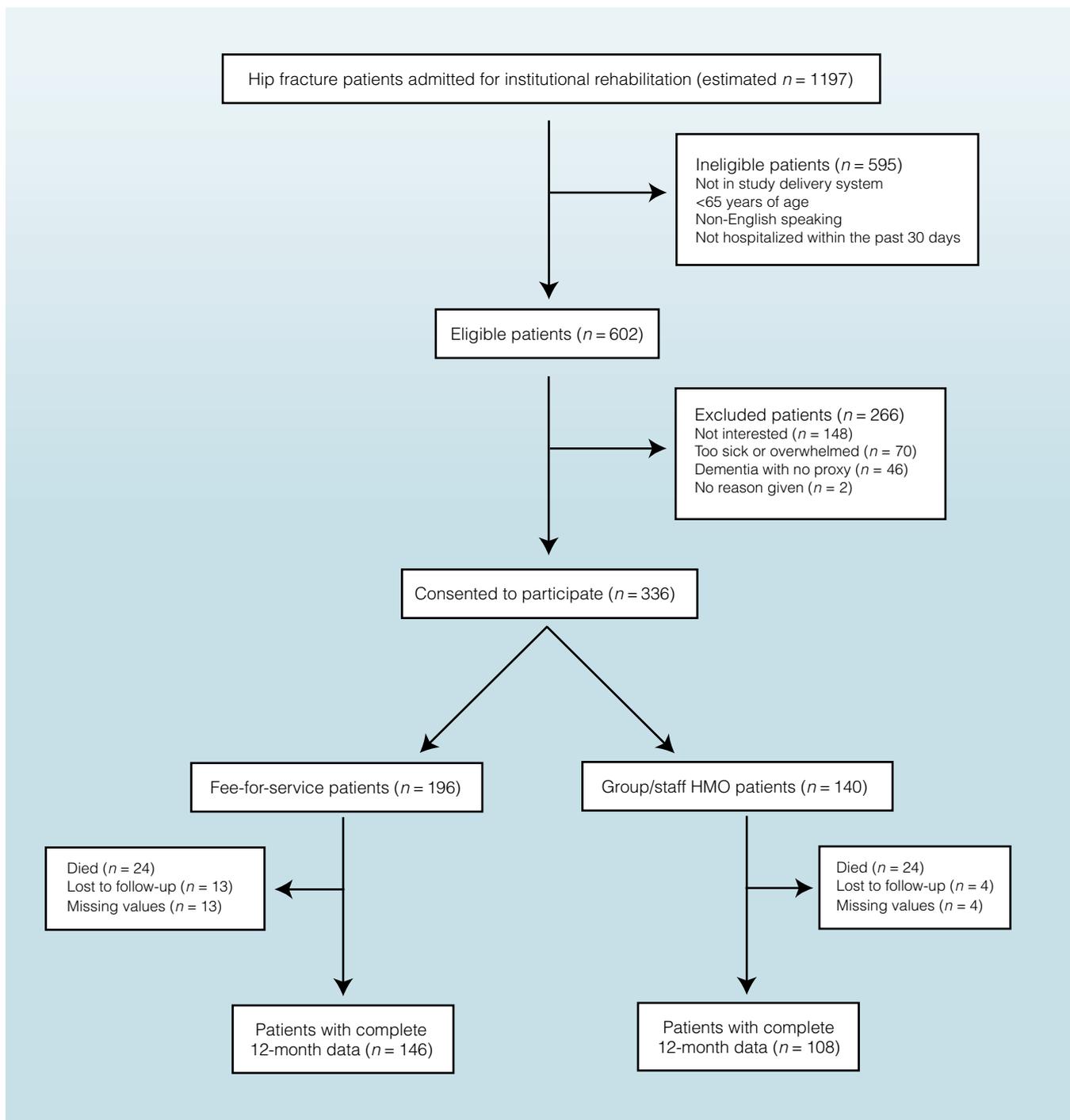


FIGURE 1. Study recruitment.

a total of 602 patients were eligible to participate. We did not have consent to obtain demographic or health status information on ineligible persons and thus were not able to characterize these patients. Two hundred sixty-six (44%) persons did not participate for the following reasons: not interested (25%); too sick or overwhelmed by their condition (12%); and confusion or advanced dementia with no proxy (8%). No reason was given in 1%. The remaining 336 (56%) patients participated in the study and were included in this analysis. There were 196 patients in the fee-for-service group, and 140 patients in the group/staff HMO group. Study participants and nonparticipants were similar with respect to age, gender, and premorbid living arrangements. Participants had attained higher levels of education and were more likely to be of non-Hispanic white ethnicity than nonparticipants. Fee-for-service nonparticipants were older and more likely to be of non-Hispanic white ethnicity than were group/staff HMO nonparticipants. Because we did not have follow-up data on nonparticipants, we were not able to comment on whether their nonparticipation biased our findings. Six fee-for-service participants (3.1%) received assistance from a proxy, compared with 13 (9.3%) group/staff HMO participants. Study participants were enrolled between June 1993 and June 1995, with follow-up continuing until June 1996. Recruitment ranged from 5 to 84 patients per plan, with an overall average of 30 patients per plan.

Data Collection

Participant demographic and health status information was obtained through an in-person interview conducted on admission to the rehabilitation setting and by telephone at 3, 6, 9, and 12-month intervals. A proxy was deemed necessary for participants when their Mini-Mental Status Examination score was less than 17.³¹ Additional information about participants' health status (general health, function, type of fracture) was obtained from the medical records of the acute-care hospital and the rehabilitation setting, nursing staff interviews, and pre- and postoperative radiographs. Facility staff provided data on admission status, physician visits, number and duration of therapy sessions, and discharge status. Nursing effort was measured by using 24-hour time studies conducted weekly for all study participants during which nurses reported time devoted directly to patient care by type of staff for each encounter. Comorbid conditions were identified from the acute-care hospital record by using the Charlson Index.³²

Utilization data were obtained directly from the participating health plans and from Medicare claims files for the fee-for-service participants. Utilization data for fee-for-service patients were obtained from Medicare

National Claims History Files Parts A and B and for group/staff HMO patients directly from participating health plans. Encounter data from the health plans were re-coded to coincide with uniform service definitions from claims data. Overall, plans provided 88% of the utilization requested. One of the group/staff HMO plans changed ownership over the course of the study and subsequently did not have the ability to provide complete utilization data on their 25 patients. Additional missing utilization data were attributed to nonmatching Medicare identification numbers ($n=8$) and no subsequent utilization because of death in the rehabilitation setting ($n=4$).

Measures

Primary outcomes, measured at 3, 6, 9, and 12 months, included recovery of function, improvement in ambulation, return to community living, and mortality. The measure of functional recovery was adapted from questions used in the Longitudinal Study on Aging.^{33,34} Patients or proxies were asked to report degree of difficulty in basic activities of daily living (ADLs) (bathing, dressing, toileting, eating, transferring, and walking) using a 4-point scale (no difficulty, some difficulty, a lot of difficulty, and unable). Patients were categorized as having recovered if they attained their prefracture functional score or better. A composite score of the six individual measures of function was computed for each patient.³⁵ Ambulation was assessed by using a validated instrument that evaluates maximum walking capacity.³⁶ Patients were asked to report their level of difficulty (0 = not able; 1 = much difficulty; 2 = some difficulty; 3 = no difficulty) in walking 20, 50, 300, 600, and 900 feet. Level of difficulty was then multiplied by distance, divided by the maximum total possible score, and multiplied by 100 to provide a 0 to 100 scale. Community living was defined as living in a home, apartment, assisted-living facility, or board-and-care home. Mortality was assessed at each 3-month follow-up interval from either proxy report or health plan records.

Design and Analysis

The study design was a prospective 1-year inception cohort. The unit of analysis was the patient, and the primary comparison was between insurance types (group/staff HMO or fee-for-service). Demographic, health status, and utilization variables were compared by using the *t*-test for continuous variables and the chi-square test for categorical variables. Nonparametric comparisons were made by using the Wilcoxon rank sum test and the Fisher exact test.

Multiple regression was used to analyze the primary outcomes of functional recovery and improved ambulation, and logistic regression was used to evaluate return

to community living. To ensure that the findings were not significantly affected by values from “outlier” individual delivery systems (rather than payment structure), we examined the contribution of each individual plan (i.e., “dummy” variables) to the overall regression models for the primary outcomes. To address potential concern for differential outcomes attributed to the use of proxy responses, the major outcome analyses were repeated comparing participants who did and did not rely on proxy report. These analyses did not differ from the main analyses and are not presented. Multiple regression (ProcReg) and logistic regression (ProcLogistic) analyses were performed by using SAS version 6.12 (SAS Institute Inc., Cary, NC).

Previous studies of older patients with hip fractures have shown high rates of death over the course of 1 year.^{15, 21, 22} In this study, the primary outcomes were analyzed with and without deaths.³⁷ Because the primary outcomes did not differ regardless of whether deaths were included in the analyses, only the former results are presented.

Results

Fee-for-service patients were older, better educated, and less likely to have an informal caregiver available (Table 1). Prefracture physical function and walking ability did not differ between the two groups. The type of hip fracture and the type of surgical repair did not differ.

Hospital Stay

On average, group/staff HMO patients underwent surgery sooner (1.1 vs. 1.4 days, $P=0.04$), received physical therapy sooner (1.5 vs. 1.8 days, $P=0.05$), and were discharged sooner to a rehabilitation setting than did fee-for-service patients (5.5 vs. 9.7 days, $P<0.01$). Examination of surgical or nonsurgical adverse events during acute-care hospitalization revealed no significant differences. By virtue of a longer stay in the hospital after surgical repair, fee-for-service patients had received an average of 4 more days of rehabilitation on admission to the rehabilitation setting than did group/staff HMO patients.

Rehabilitation Stay

Comparisons of the care provided in the rehabilitation setting are reported in Table 2. Significantly more fee-for-service patients were admitted to an RF than an SNF. On average, fee-for-service patients remained in the rehabilitation setting 2 days longer than did group/staff HMO patients. During their longer stays, fee-for-service patients received more care from physical and occupational therapists. Group/staff HMO patients, however, were more likely to receive care from physical

therapy technicians, such that total physical therapy department time was not significantly different. Although the number of hours of licensed nursing care did not differ, group/staff HMO patients received more care from nursing staff with less formal training. No differences were detected in the total number of attending physician visits. Fee-for-service patients were more likely to be seen by an orthopedic surgeon, physiatrist, or consulting specialist physician, whereas group/staff HMO patients were more likely to be seen by a board-certified geriatrician, nurse practitioner, and/or physician assistant. Group/staff HMO plans seem to have substituted care providers at all levels but provided similar service intensity overall.

Post Rehabilitation

Patients' utilization patterns in the year after discharge from the index rehabilitation stay are provided in Table 3. There were no differences in rehospitalization rates or emergency department use. Fee-for-service patients received more outpatient physician visits (all-inclusive) and more primary care, orthopedist, and consulting specialist physician visits. Group/staff HMO patients had significantly more visits from home health nurses.

Mortality rates between the two groups did not differ. Mortality rates for fee-for-service and group/staff HMO patients at 3, 6, 9, and 12 months were 4.7% versus 4.9% ($P=0.99$); 8.3% versus 11.4% ($P=0.44$); 10.3% versus 14.9% ($P=0.23$), and 12.0% versus 16.9% ($P=0.26$), respectively. After adjustment for age, comorbid conditions, and cognitive function, no differences in mortality were noted between the two groups.

Functional Outcomes

The other primary outcomes are compared in Figures 2 through 4. Overall, no differences were found between group/staff HMO and fee-for-service patients. Group/staff HMO patients had better functional recovery at 6 months ($P<0.01$) and ambulation at 12 months ($P=0.05$) than did fee-for-service patients, although these were isolated findings. These regression analyses were adjusted as follows: Functional recovery was adjusted for prefracture function, type of fracture repair, age, marital status, cognitive function, and communicative ability; ambulation was adjusted for prefracture ambulation score, type of fracture, age, previous stroke, cognitive function, communicative ability, and depression; and return to community living was adjusted for prefracture functional status, type of fracture repair, marital status, cognitive function, and communicative ability.

There was no evidence that outlying values for individual delivery systems influenced any of the primary outcomes. For example, in the 6-month comparison

TABLE 1

Baseline Demographic and Functional Characteristics of Older Patients with Hip Fracture in Fee-for-Service and Group/Staff HMO Systems

| CHARACTERISTIC | FEE-FOR-SERVICE (n=196) | HMO (n=140) | P VALUE |
|---|----------------------------|-----------------|---------|
| Demographic characteristics | | | |
| Mean age \pm SD, yr | 82.1 \pm 7.3 | 79.8 \pm 6.9 | <0.01 |
| Female | 80.5% | 76.1% | >0.2 |
| White | 96.9% | 99.3% | >0.2 |
| Not a high school graduate | 17.9% | 27.3% | 0.04 |
| Income <\$10,000 | 35.7% | 27.0% | >0.2 |
| Type of Social Support | | | |
| Married | 29.1% | 38.6% | 0.08 |
| Living with others | 45.0% | 49.6% | >0.2 |
| Able and willing caregiver | 44.8% | 72.6% | <0.01 |
| Preadmission residence in institution | 1.0% | 0.7% | >0.2 |
| Comorbid conditions | | | |
| Charlson Index \pm SD | 1.4 \pm 1.5 | 1.2 \pm 1.4 | 0.10 |
| Diabetes | 12.8% | 9.6% | >0.2 |
| Angina | 6.2% | 4.4% | >0.2 |
| Previous myocardial infarction | 9.2% | 10.3% | >0.2 |
| Congestive heart failure | 17.4% | 12.5% | >0.2 |
| Peripheral vascular disease | 9.2% | 8.8% | >0.2 |
| Cerebrovascular disease | 12.3% | 11.0% | >0.2 |
| Moderate/severe renal disease | 1.5% | 0.0% | >0.2 |
| Chronic pulmonary disease | 16.9% | 15.4% | >0.2 |
| Any psychiatric diagnosis | 10.3% | 4.4% | 0.06 |
| Mean number of medications \pm SD | 5.5 \pm 2.4 | 5.3 \pm 2.7 | >0.2 |
| Conditions at admission to the rehabilitation facility | | | |
| Visual impairment | 9.7% | 5.1% | 0.15 |
| Hearing impairment | 15.9% | 3.7% | <0.01 |
| Pressure sore (any) | 24.1% | 12.6% | 0.01 |
| Difficulty with communication | 14.8% | 16.3% | >0.2 |
| Functional status before fracture | | | |
| Mean number of ADLs* performed with difficulty \pm SD | 0.56 \pm 1.4 | 0.73 \pm 0.2 | 0.20 |
| Mean maximum walking score (0–100) | 62.6 \pm 40.3 | 68.7 \pm 42.9 | 0.18 |
| Functional status on admission to rehabilitation | | | |
| Barthel Index (0–20) \pm SD | 12.2 \pm 4.0 | 11.9 \pm 4.8 | >0.2 |
| Mean number of ADLs* (0–6) | 3.7 \pm 1.4 | 3.6 \pm 1.4 | >0.2 |
| Bladder incontinence | 23.5% | 33.6% | 0.06 |
| Bowel incontinence | 11.2% | 23.1% | 0.01 |
| Cognitive/psychological status | | | |
| Mean Mini-Mental Status Examination (0–30) | 26.2 \pm 3.7 | 25.0 \pm 4.6 | 0.01 |
| Depression diagnosis | 9.7% | 4.4% | 0.09 |
| Type of hip fracture and repair† | | | |
| Femoral neck fracture | 48.5% | 50.0% | >0.2 |
| Prosthesis | 69% | 74% | >0.2 |
| Pins | 14% | 7% | >0.2 |
| Nails | 12% | 11% | >0.2 |
| Intertrochanteric fracture | 50.5% | 47.8% | >0.2 |
| Subtrochanteric fracture | 1.0% | 2.2% | >0.2 |

*ADLs = activities of daily living, including bathing, dressing, eating, toileting, transferring, and walking.

†All intertrochanteric and subtrochanteric fractures were surgically managed with nails.

of ADL recovery, all of the regression model parameter estimates for the group/staff HMO systems were posi-

tive, whereas all but one of the parameter estimates from the fee-for-service system were negative. This difference

TABLE 2

Services Provided to Hip Fracture Patients during the Index Rehabilitation Stay

| SERVICE | FEE-FOR-SERVICE (n=196) | HMO (n=140) | P VALUE |
|--|----------------------------|-----------------|---------|
| Initial rehabilitation admission to a skilled nursing facility | 71.4% | 93.6% | <0.01 |
| Initial length of stay \pm SD, d | 22.5 \pm 14.3 | 20.5 \pm 18.3 | 0.01 |
| Mean nursing time \pm SD, hr | | | |
| Registered nurse, licensed practical nurse | 19.8 \pm 14.7 | 21.0 \pm 22.9 | 0.31 |
| Aide/orderly/technician | 17.6 \pm 15.0 | 29.6 \pm 31.3 | <0.01 |
| Mean time in therapy \pm SD, hr | | | |
| Physical therapist time | 7.5 \pm 5.8 | 6.3 \pm 7.5 | <0.01 |
| Physical therapy department time* | 13.7 \pm 7.7 | 14.4 \pm 11.9 | 0.28 |
| Occupational therapy department time | 9.9 \pm 7.6 | 7.4 \pm 6.5 | <0.01 |
| Provider visits | | | |
| Attending physician | 6.5 | 6.4 | 0.98 |
| Consulting physician | 3.6 | 1.5 | <0.01 |
| Physician's assistant/nurse practitioner | 2.1 | 3.9 | <0.01 |
| Orthopedist | 2.0 | 1.1 | <0.01 |
| Percentage with orthopedist visits | 61.5% | 40.4% | <0.01 |
| Total physiatrist visits | 4.2 | 0.3 | <0.01 |
| Percentage with physiatrist visits | 40.5% | 4.4% | <0.01 |
| Total geriatrician visits | 0.5 | 2.3 | <0.01 |
| Percentage with geriatrician visits | 10.8% | 47.1% | <0.01 |
| Hospitalization | | | |
| Rehospitalized during rehabilitation | 1.5% | 1.5% | 0.99 |

*Includes time with the therapist as well as technicians.

is not only consistent with the main result but also suggests that each health system made a similar contribution to the overall findings.

Discussion

Overall, we found little evidence to suggest that the outcomes of care for older adults with hip fracture receiving institutional rehabilitation differed between group/staff HMO and fee-for-service delivery systems. Our results add to the growing number of studies in the literature showing that the quality of care for patients within capitated payment systems is at least as good as that for patients in fee-for-service systems. What distinguishes our findings, however, is that we have shown that this relationship extends longitudinally across sites of geriatric care, to encompass an entire episode of care.

When compared with previous studies that have examined the influence of reimbursement on the care delivered to persons with hip fracture,^{22–26} our study revealed a similar finding for the effect of bundled payment on the type of services provided. The inten-

sity of physician services in particular was lower under the capitated payment of group/staff HMOs. Further, group/staff HMO plans seemed to have substituted personnel with less formal training—for example, nurse practitioners and physician assistants for physicians, technicians for physical therapists, and aides and medical assistants for licensed nurses. Group/staff HMO patients had less intense involvement of orthopedic surgeons and physiatrists and more contact with geriatricians in the postacute care period. The association between greater geriatrician involvement with improved rehabilitative outcomes for hip fracture has been reported previously.^{38–40} However, overall our findings are similar to these earlier studies, as differences in service intensity and care providers did not translate into meaningful differences in outcomes.

Because of a potential for bias attributable to the disproportionately greater use of rehabilitation facilities by fee-for-service plans (29% vs. 6%), we conducted additional analyses of primary outcomes restricted to fee-for-service and group/staff HMO patients who were treated in SNFs. These results did not differ

TABLE 3
Utilization in the Year after the Index Rehabilitation Stay*

| UTILIZATION VARIABLE | FEE-FOR-SERVICE (n=187) | GROUP/STAFF HMO (n=112) | P VALUE |
|--|----------------------------|----------------------------|---------|
| Percentage rehospitalized by 12 months | 39.0% | 33.0% | >0.2 |
| Number of emergency department visits | 0.59 | 0.75 | >0.2 |
| Percentage of patients returning to rehabilitation after initial stay | 15.0% | 16.1% | >0.2 |
| Average length of stay among those returning to rehabilitation after initial stay, d | 17.0 | 29.3 | 0.05 |
| Total number of days in rehabilitation setting (initial + subsequent days) less ± SD | 25.3 ± 16.1 | 24.2 ± 27.6 | <0.01 |
| Total physician visits—outpatient | 13.2 | 4.8 | <0.01 |
| Primary care visits—outpatient | 3.7 | 2.0 | <0.01 |
| Percentage receiving a primary care visit | 64.7% | 51.4% | 0.04 |
| Orthopedic surgeon visits—outpatient | 2.4 | 1.2 | <0.01 |
| Percentage receiving orthopedic surgeon visit | 70.7% | 46.7% | <0.01 |
| Specialist physician (nonorthopedist) visits—outpatient | 7.1 | 1.6 | <0.01 |
| Percentage receiving a specialist visit | 86.4% | 35.5% | <0.01 |
| Physician's assistant/nurse practitioner visits—outpatient | 0.2 | 1.3 | <0.01 |
| Home health visits ± SD | 2.8 ± 6.0 | 8.8 ± 22.1 | <0.01 |
| Percentage receiving home health visit | 62.0% | 54.2% | >0.2 |
| Physical therapy visits | 2.3 | 3.8 | 0.10 |
| Percentage receiving physical therapy visit | 62.0% | 40.2% | <0.01 |
| Occupational therapy visits | 0.4 | 1.7 | 0.05 |
| Percentage receiving occupational therapy visits | 20.7% | 18.7% | >0.2 |

*Sample sizes reported in this table reflect absence of data due to a change in ownership in one managed care plan (n=25), nonmatching Medicare identification numbers among fee-for-service plans (n=8), and deaths that occurred during the index rehabilitation stay in fee-for-service (n=1) and group/staff HMO (n=3) facilities.

from the main outcomes analyses and are not presented. These additional analyses support earlier published literature that outcomes among patients with hip fracture treated in SNFs differ little from those of patients treated in rehabilitation facilities^{41, 42} and calls into question the value of the more resource-intensive rehabilitation facilities. However, these relationships between payment system, treatment setting, service intensity, and outcomes cannot be generalized beyond hip fracture. A similar study comparing patients with stroke in group/staff HMO and fee-for-service settings has found better functional and community discharge outcomes for persons with stroke treated in fee-for-service settings.⁴³

The patients in our study had better outcomes than those reported in previous studies. These improved outcomes may be partially explained by patient selection. Patients in this trial were more likely to recover by virtue of the fact that they were admitted for institutional rehabilitation (i.e., had a greater potential for recovery). Because of this sampling strategy, study participants were more similar and theoretically, more comparable. However, our results can only be generalized to those older patients with hip fracture receiving institutional rehabilitation. Our primary reason for targeting this particular population was that they have the greatest burden of disability, require the most services, and are the most costly to treat. Logically, a capitated

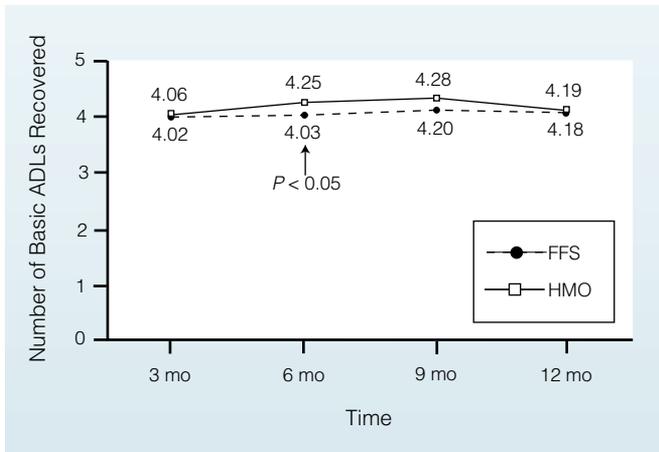


FIGURE 2. Recovery of basic activities of daily living (ADLs): fee-for-service (FFS) versus group/staff HMO systems.

delivery system would focus cost-containment strategies on these patients and thus important differences may be revealed in studying this population.

The results of our study need to be interpreted in light of several limitations. First, the facilities studied were not selected at random—they were selected because of an established reputation for providing excellent geriatric rehabilitative services. Although studying these facilities is important for understanding the potential for improved outcomes for patients with hip fracture, this approach limits the generalizability of the findings. The delivery systems studied may not have been representative of capitated or fee-for-service delivery systems with a different organizational structure, longevity, or geo-

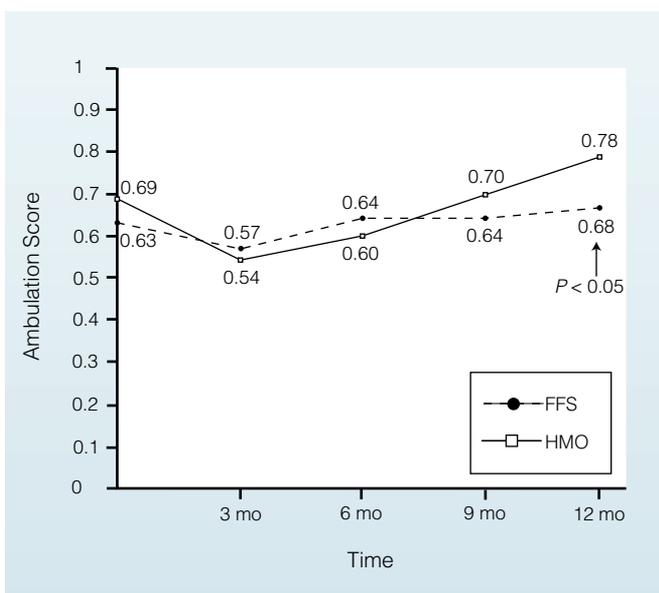


FIGURE 3. Ambulation score: fee-for-service (FFS) vs. group/staff HMOs.

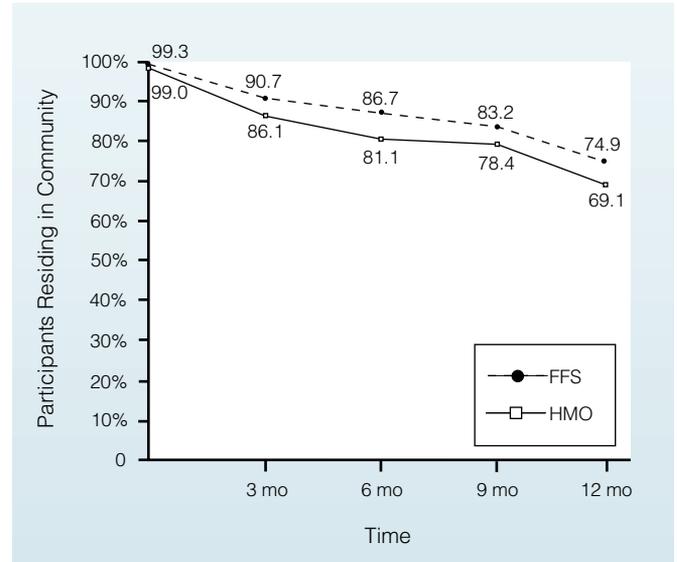


FIGURE 4. Community residence: fee-for-service (FFS) versus group/staff HMO systems.

graphic location. Further, our focus was on a select population of older patients receiving institutional rehabilitation for hip fracture. We did not include patients who were able to return home immediately after their index hospitalization or those believed not to benefit from institutional rehabilitation. In addition, although we attempted to control for baseline differences between the two payment structure groups, we cannot exclude the possibility that our results were influenced by some degree of uncontrolled confounding. Study power may potentially have precluded detecting significant differences in the primary outcomes; however, our results revealed little suggestion of positive trends despite assessment of multiple outcome measures over four time points. Finally, although it would have strengthened these findings, a formal cost analysis was beyond the scope of this study's focus on clinical outcomes.

In conclusion, we found no evidence that group/staff HMO systems delivered substandard care with respect to important clinical outcomes for older adults with hip fracture receiving institutional rehabilitation. Despite differences in service intensity, treatment location (i.e., subacute SNFs) and care providers, these well-integrated group/staff HMO plans were able to care for persons with hip fracture over the entire episode of care as effectively as select fee-for-service delivery systems. Although these results cannot be generalized to capitated or fee-for-service comparisons in other parts of the country, they do provide supportive evidence that the quality of acute hip fracture care in group/staff HMO delivery systems is at least as good as in fee-for-service delivery systems.

Take-Home Points

- Although many studies have compared quality of care between capitated and fee-for-service payment systems in specific settings, none has compared outcomes for clinical conditions in which care is delivered longitudinally across multiple settings.
- We compared outcomes for patients receiving institutional rehabilitation after hip fracture in five group/staff HMO and six fee-for-service delivery systems with reputations for commitment to geriatric rehabilitation.
- Overall, there were no differences in functional recovery, ambulation scores, return to community living, or mortality between group/staff HMO and fee-for-service systems.
- Group/staff HMOs provided a lower intensity of physician services and substituted personnel with less formal training for physicians, physical therapists, and licensed nurses.
- Because the group/staff HMO and fee-for-service systems in our study were selected for their commitment to geriatric rehabilitation, caution is advised in generalizing our findings to other settings.

References

1. Group Health Association of America. Patterns in HMO Enrollment. Washington, DC: Group Health Association of America; 1995.
2. Miller RH, Luft HS. Does managed care lead to better or worse quality of care? *Health Aff (Millwood)*. 1997;16:7-25.
3. Retchin SM, Brown B. Management of colorectal cancer in Medicare health maintenance organizations. *J Gen Intern Med*. 1990;5:110-4.
4. Retchin SM, Brown B. The quality of ambulatory care in Medicare health maintenance organizations. *Am J Public Health*. 1990;80:411-5.
5. Carlisle DM, Siu AL, Keeler EB, et al. HMO vs fee-for-service care of older persons with acute myocardial infarction. *Am J Public Health*. 1992;82:1626-30.
6. Lurie N, Christianson J, Finch M, Moscovice I. The effects of capitation on health and functional status of the Medicaid elderly: a randomized trial. *Ann Intern Med*. 1994;120:506-11.
7. Preston JA, Retchin SM. The management of geriatric hypertension in health maintenance organizations. *J Am Geriatr Soc*. 1991;39:683-90.
8. Miller RH, Luft HS. Managed care plan performance since 1980. *JAMA*. 1994;271:1512-9.
9. Riley GF, Potosky AL, Klabunde CN, Warren JL, Ballard-Barbash R. Stage at diagnosis and treatment patterns among older women with breast cancer: an HMO and fee-for-service comparison. *JAMA*. 1999;281:720-6.
10. Shaughnessy PW, Schlenker RE, Hittle DF. Home health care outcomes under capitated and fee-for-service payment. *Health Care Financ Rev*. 1994;16:187-222.
11. Ware JE, 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*. 1996;276:1039-47.
12. Marottoli RA, Berkman LF, Leo-Summers L, Cooney LM. Predictors of mortality and institutionalization after hip fracture: The New Haven EPESE cohort. *Am J Public Health*. 1994;84:1807-12.
13. Cummings SR, Rubin SM, Black D. The future of hip fractures in the United States: numbers, costs, and potential effects of postmenopausal estrogen. *Clin Orthop*. 1990;252:163-6.
14. Mossey JM, Mutran E, Knott K, Craik R. Determinants of recovery 12 months after hip fracture: the importance of psychosocial factors. *Am J Public Health*. 1989;79:279-86.
15. Jette AM, Harris BA, Cleary PD, Campion EW. Functional recovery after hip fracture. *Arch Phys Med Rehabil*. 1987;68:735-40.
16. Magaziner J, Simonsick E, Kashner M, Hebel JR, Kenzora JE. Predictors of functional recovery one year following hospital discharge for hip fracture: a prospective study. *J Gerontol*. 1990;45:M101-7.
17. Lyons AR. Clinical outcomes and treatment of hip fractures. *Am J Public Health*. 1997;103:51S-63S.
18. Parker MJ, Palmer CR. Prediction of rehabilitation after hip fracture. *Age Ageing*. 1995;24:96-8.
19. Lu-Yao GL, Baron JA, Barrett JA, Fisher ES. Treatment and survival among elderly Americans with hip fractures: a population-based study. *Am J Public Health*. 1994;84:1287-91.
20. Ray WA, Griffin MR, Baugh DK. Mortality following hip fracture before and after implementation of the prospective payment system. *Arch Intern Med*. 1990;150:2109-14.
21. Magaziner J, Simonsick EM, Kashner TM, Hebel JR, Kenzora JE. Survival experience of aged hip fracture patients. *Am J Public Health*. 1989;79:274-8.
22. Ray WA, Griffin MR, Baugh DK. Mortality following hip fracture before and after implementation of the prospective payment system. *Arch Intern Med*. 1990;150:2109-14.
23. Gerety MB, Soderholm-Difatte V, Winograd CH. Impact of prospective payment and discharge location on the outcome of hip fracture. *J Gen Intern Med*. 1989;4:388-91.
24. Fitzgerald JF, Fagan LF, Tierney WM, Dittus RS. Changing patterns of hip fracture care before and after the prospective payment system. *JAMA*. 1987;258:218-21.
25. Fitzgerald JF, Moore DR. The care of elderly patients with hip fracture. Changes since implementation of the prospective payment system. *N Engl J Med*. 1989;320:871-2.
26. Palmer RM, Saywell RM, Zollinger T, et al. The impact of the prospective payment system on the treatment of hip fractures in the elderly. *Arch Intern Med*. 1989;149:2237-41.
27. Morrison RS, Chassin MR, Siu AL. The medical consultant's role in caring for patients with hip fracture. *Ann Intern Med*. 1998;128:1010-20.
28. Kane RL, Finch M, Blewett L, Chen Q, Burns R, Moskowitz M. Use of post-hospital care by Medicare patients. *J Am Geriatr Soc*. 1996;44:242-50.
29. Prospective Payment Assessment Commission. The Changing Health Care Delivery Environment. In Medicare and the American Health Care System. Report to Congress. 1994;805:65-86.
30. Kramer A, Steiner J, Kowalsky J. Rehab for the elderly. *HMO Magazine*. 1994;35:15-9.

31. Folstein MF, Folstein SE, McHugh PR. "Mini-Mental State": A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975;12:189-98.
32. Charlson ME, Pompei P, Alex KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40:373-83.
33. Wolinsky FD, Johnson RJ. The use of health services by older adults. *J Gerontol.* 1991;46:S345-57.
34. Wolinsky FD, Callahan CM, Fitzgerald JF, Johnson RJ. The risk of nursing home placement and subsequent death among older adults. *J Gerontol.* 1992;47:S173-82.
35. Fitzgerald JF, Smith DM, Martin DK, Freedman JA, Wolinsky FD. Replication of the multidimensionality of activities of daily living. *J Gerontol.* 1993;48:S28-31.
36. Regensteiner JG, Steiner JF, Panzer RJ, Hiatt WR. Evaluation of walking impairment by questionnaire in patients with peripheral arterial disease. *Journal of Vascular Medicine and Biology.* 1990;2:142-52.
37. Diehr P, Patrick DL, Hedrick S, et al. Including deaths when measuring health status over time. *Med Care.* 1995;33:AS164-72.
38. Gustafson Y, Brännström B, Berggren D, et al. A geriatric-anesthesiologic program to reduce acute confusional states in elderly patients treated for femoral neck fractures. *J Am Geriatr Soc.* 1991;39:655-62.
39. Hemsall VJ, Robertson DRC, Campbell MJ, Briggs RS. Orthopedic geriatric care—is it effective? *J R Coll Physicians Lond.* 1990;24:47-50.
40. Zuckerman JD, Sakales SR, Fabian DR, Frankel VH. Hip fractures in geriatric patients: results of an interdisciplinary hospital care program. *Clin Orthop.* 1992;274:213-25.
41. Kramer AM, Steiner JF, Schlenker RE, et al. Outcomes and costs after hip fracture and stroke. *JAMA.* 1997;277:396-404.
42. Levi SJ. Posthospital setting, resource utilization, and self-care outcome in older women with hip fracture. *Arch Phys Med Rehabil.* 1997;78:973-9.
43. Kramer AM, Kowalsky JC, Lin M, Grigsby J, Hughes R, Steiner J. Outcomes and utilization for acute stroke in HMO and fee-for-service delivery systems. *J Am Geriatr Soc* 2000; 48:726-34.

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