The effectiveness and efficiency of outpatient geriatric evaluation and management (GEM) was compared to usual outpatient primary care (UPC). Although GEM had no overall impact on health care utilization or cost of care for the entire study period, significant reductions were found during the sixteen- to twenty-four-month study period, suggesting a possible investment effect. In the first eight months of the study, GEM patients incurred 34.8% more in health care costs than UPC patients, but in the final eight months of the study the cost of care for UPC patients exceeded that for GEM patients by 37.8%.

Key Words: Geriatric evaluation and management, Frail elderly, Primary care, Health services utilization, Team care, Veterans

Outpatient Geriatric Evaluation and Management: Is There an Investment Effect?1

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Older adults are increasing more rapidly than any other segment of the population (Schick & Schick, 1994) and, with increasing age, their health care utilization and costs increase dramatically (Schneider & Guralnik, 1990). For example, although older adults make up only approximately 13% of the U.S. population (Department of Health and Human Services, 1990), they incur more than 35% of total health care costs and 45% of hospital expenditures for adults (Hahn & Lefkowitz, 1992). Geriatric evaluation and management (GEM), which includes comprehensive assessment and continuing care by a team of health care professionals, has been proposed as one means of controlling costs while delivering high quality health care to frail older adults (National Institutes of Health, 1988). As GEMs have increased in popularity and importance in VA and non-VA health care settings, there has been a surge in interest in monitoring and evaluating their effectiveness and efficiency.

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tions, and intervention methods may account for these divergent findings.

The question of whether outpatient GEMS can reduce health care utilization and cost also remains unanswered. In earlier reports of data from the current study, Toseland and colleagues (Toseland et al., 1996; Engelhardt et al., 1996) reported no significant differences among patients in usual primary care or GEM in total outpatient or inpatient utilization or total costs of care after 8- and 16-month assessments. Rubin and colleagues (Rubin et al., 1992) found that GEM significantly reduced inpatient costs. It also produced a shift from inpatient to home care services, and a nonsignificant trend toward reduced total charges billed to Medicare Part A and Part B one year after randomization. Williams and colleagues (Williams et al., 1987) reported a 25% nonsignificant reduction in institutional cost among GEM outpatients one year after randomization. Epstein and colleagues (Epstein et al., 1990) reported a significantly higher number of office visits for geriatric assessment and consultation patients than for controls, with no corresponding decrease in hospitalization rates or nursing home placement one year after randomization. They noted, however, that patients in their study were relatively healthy and did not receive follow-up care from the consultation team, two factors associated with poorer utilization and cost outcomes for inpatient GEMS. Given the widespread and growing use of outpatient GEM teams, and the equivocal results of previous studies, additional research appears warranted.

An early study of an inpatient geriatric evaluation and management unit revealed that it had a variety of beneficial effects on the health status and health care costs of elderly patients (Rubenstein et al., 1984). In the report, Rubenstein and colleagues suggested that GEM may offer an “investment strategy” in which the higher cost of more intensive care at the outset of service delivery is recouped by a subsequent reduction in health services utilization and associated cost savings. If this mechanism extends to the provision of outpatient GEM, cost savings would accrue over the long term, after an initial increase in health service use. For example, Burns et al. (1995) found a reduction in hospital admissions for GEM patients during the second six months of a one-year trial evaluating the effectiveness of outpatient GEM.

The literature indicates that outpatient GEM teams tend to see patients more frequently (Epstein et al., 1990; Yeo et al., 1997; Silverman et al., 1995; Toseland et al., 1996), to uncover more untreated medical conditions (Epstein et al., 1990; Tulloch & Moore, 1979), and to order more diagnostic tests (Epstein et al., 1990) following the comprehensive assessment. These findings suggest that outpatient GEMS make an initial investment in patient care that is substantially greater than usual primary care. Evaluations of outpatient GEMS have tended to aggregate health, utilization, and cost data over entire study periods, even though they may initially rise, and then fall. This practice could mask changes in outcomes over time. Also, it may take longer to realize cost savings and health gains among outpatients because they are not as debilitated as inpatients. Yet, evaluations of outpatient GEMS have rarely examined outcomes beyond one year.

The study reported here is based on a two-year investigation into the effectiveness of an outpatient GEM team. By collecting data during three eight-month intervals, and using a random effects general linear model during data analyses, the study was specifically designed to examine changes in health status, health care utilization, and costs over time. The study addresses the question of whether an investment in a comprehensive geriatric assessment and continuing care by an outpatient GEM team improves health status while reducing the utilization of health services and the cost of care over a two-year period.

Methods

Subjects
Subjects were recruited from a 450-bed Veterans Affairs Medical Center (VAMC) which served 21,301 outpatients in 1994. Subjects were identified using the Decentralized Hospital Computer Program (DHCP) and the Department of Veterans Affairs (VA’s) local computerized medical records database, as well as the VA’s national administrative databases. The literature suggests that GEM care is most effective when it is targeted to the frail elderly (Rubenstein, Stuck, Siu, & Wieland, 1991). To target a frail population, only patients who were age 55 or older, and had 10 or more outpatient clinic visits in the previous year were selected for inclusion in the study. Also, patients were screened for functional disability with a measure that assessed deficits in activities of daily living (ADLs) and instrumental activities of daily living (IADLs; Rensselaer Polytechnic Institute, 1985).

Individuals aged 55 to 75 with at least one ADL and two IADL impairments or individuals over 75 who had any combination of two ADL or IADL impairments were invited to participate. Exclusion criteria included: (a) severe cognitive impairment indicated by the Short Portable Mental Status Questionnaire (SPMSQ; Pfeiffer, 1975), (b) psychiatric hospitalization within the previous year, (c) having received care in the previous year from an interdisciplinary health care team. The first and second criteria were included to ensure reliable responses to the research interview, and the third criterion was included to eliminate the potential confounding effects of participation in other interdisciplinary care.

Two hundred five veterans met all the criteria, and of these, 160 agreed to participate. As shown in Table 1, the average participant was 72 years old, with approximately two ADL impairments and four IADL impairments. Baseline comparisons of subjects on demographic and health status variables, also presented in Table 1, revealed no significant differences between the two intervention conditions.

By the 24-month assessment, it was not possible to
were placed in nursing homes, and 4 were hospitalized, including those who were receiving care in other VA settings. Of the 77 who were deceased, 9 requested not to be interviewed, 3 ceased, 7 requested not to be interviewed, 8 were from 65 patients. In the UPC condition, 18 patients moved.

<table>
<thead>
<tr>
<th>Variable</th>
<th>UPC (n = 80)</th>
<th>GEM (n = 80)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>72.60</td>
<td>71.70</td>
<td>.367</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>77</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>3</td>
<td>5</td>
<td>.468</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>48</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>21</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Post-high school</td>
<td>11</td>
<td>10</td>
<td>.971</td>
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<tr>
<td>Employment</td>
<td></td>
<td></td>
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<tr>
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<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Not working</td>
<td>79</td>
<td>78</td>
<td>.560</td>
</tr>
<tr>
<td>Marital status</td>
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</tr>
<tr>
<td>Married (living with spouse)</td>
<td>50</td>
<td>48</td>
<td></td>
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<tr>
<td>Other</td>
<td>30</td>
<td>32</td>
<td>.746</td>
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<tr>
<td>Health and Functional Status</td>
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<td></td>
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<tr>
<td>Functional independence measure</td>
<td>115.39</td>
<td>113.15</td>
<td>.229</td>
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<tr>
<td>Activities of daily living</td>
<td>1.73</td>
<td>1.61</td>
<td>.618</td>
</tr>
<tr>
<td>Instrumental activities of daily living</td>
<td>3.56</td>
<td>4.10</td>
<td>.131</td>
</tr>
<tr>
<td>Perceived health</td>
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<tr>
<td>Health perception</td>
<td>11.60</td>
<td>11.10</td>
<td>.456</td>
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<tr>
<td>Pain</td>
<td>2.73</td>
<td>2.58</td>
<td>.474</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>1.49</td>
<td>1.16</td>
<td>.104</td>
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<tr>
<td>Role functioning</td>
<td>0.36</td>
<td>0.38</td>
<td>.894</td>
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<tr>
<td>Social functioning</td>
<td>4.08</td>
<td>3.65</td>
<td>.134</td>
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<tr>
<td>Mental health</td>
<td>22.66</td>
<td>22.13</td>
<td>.383</td>
</tr>
<tr>
<td>Number of diagnoses</td>
<td>2.63</td>
<td>2.53*</td>
<td>.642</td>
</tr>
<tr>
<td>Medical problems (% of sample)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Bladder/renal</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Blood</td>
<td>2</td>
<td>1</td>
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</tr>
<tr>
<td>Bone</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Circulatory</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>13</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>13</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Digestive</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Endocrine</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Eye</td>
<td>2</td>
<td>2</td>
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<td>Heart</td>
<td>14</td>
<td>17</td>
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</tr>
<tr>
<td>Hypertension</td>
<td>15</td>
<td>20</td>
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<td>Melanoma</td>
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<td>0</td>
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<tr>
<td>Neurologic</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Skin</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>5</td>
<td>.423</td>
</tr>
</tbody>
</table>

* n = 70.

Table 1. Baseline Demographic, Health, and Functional Status Characteristics of Participants in UPC and GEM

Collect health and functional status interview data from 65 patients. In the UPC condition, 18 patients were deceased, 9 requested not to be interviewed, 3 were placed in nursing homes, and 4 were hospitalized. In the GEM condition, 12 patients were deceased, 7 requested not to be interviewed, 8 were placed in nursing homes, 1 was hospitalized, and 3 moved.

Except for those who were deceased, health care utilization data and cost data continued to be collected from medical records on all study patients, including those who were receiving care in other VA medical centers. Sample sizes for health care utilization and cost data at the beginning of each measurement period are presented in Tables 2 and 3.

UPC and GEM Clinics

Patients receiving UPC attended primary care clinics that were typically staffed by a physician with only triage nursing support. The physician provided primary outpatient care, with referrals made to specialty clinics and allied health services as needed. UPC physicians provided walk-in urgent/emergent care services during regular clinic hours, but not at other times. UPC physicians provided initial consultation regarding the care of the patient in the inpatient setting, with limited follow-up. Upon discharge, patients needing continuing outpatient care were scheduled for an appointment with their UPC provider. UPC physicians were usually not directly involved in discharge planning efforts.

The GEM team was composed of a nurse practitioner, a board-certified geriatrician, and a social worker. In contrast with UPC, the majority of direct care was provided by the nurse practitioner. The geriatrician served as a consultant to the nurse practitioner, and as the supervisor of patients’ overall care. The social worker coordinated team activity and addressed patients’ and caregivers’ psychosocial and financial needs, including appropriate psychological and social service referrals. However, as the patients became well known to the entire team and existing psychosocial problems were addressed, social work services were rendered on a consultation rather than a routine basis. Components of the GEM intervention included: (1) an initial comprehensive assessment, (2) the development and implementation of a care plan, (3) follow-up and periodic reassessment, (4) monitoring and revision of the care plan, and (5) referral to, and coordination with, other VA and non-VA health and social service providers. Team members met weekly to discuss, develop, and update assessments and care plans. Patients were seen for routine follow-up in the GEM clinic, and team members provided walk-in care during daytime hours. The GEM team also provided treatment recommendations for patients hospitalized for acute care, and was actively involved in discharge planning.

Design

A 2 x 3 (2 intervention conditions, i.e., GEM and UPC, and 3 intervals of measurement, i.e., 8, 16, and 24 months) randomized control group design was used. After obtaining informed consent, patients were randomly assigned to the UPC or the GEM condition (n = 80 in both conditions). Patient outcomes were attributed to the condition to which the individual was initially assigned, regardless of current treatment status, in accordance with an intention to treat methodology (Applegate & Curb, 1990; Pocock, 1984).

Hypotheses

It was hypothesized that as compared to UPC pa-
Table 2. Health Care Utilization Outcomes During a 24-Month Period

<table>
<thead>
<tr>
<th>Variable</th>
<th>8 Months</th>
<th>16 Months</th>
<th>24 Months</th>
<th>Condition</th>
<th>Time</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient Utilization</td>
<td>1.93d</td>
<td>1.18d</td>
<td>1.81d</td>
<td>2.16d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary care UPC</td>
<td>3.55d</td>
<td>1.95d</td>
<td>3.46d</td>
<td>2.81d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>1.99d</td>
<td>2.35d</td>
<td>3.47d</td>
<td>7.56d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>2.39d</td>
<td>2.67d</td>
<td>1.84d</td>
<td>4.35d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPC</td>
<td>3.00d</td>
<td>3.48d</td>
<td>3.07d</td>
<td>2.91d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency room</td>
<td>3.48d</td>
<td>3.99d</td>
<td>3.28d</td>
<td>3.78d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total clinic visits</td>
<td>1.90d</td>
<td>2.51d</td>
<td>1.53d</td>
<td>2.53d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>1.43d</td>
<td>2.45d</td>
<td>1.05d</td>
<td>2.12d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital admissions</td>
<td>20.06d</td>
<td>15.20d</td>
<td>20.72d</td>
<td>18.62d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>22.78d</td>
<td>16.91d</td>
<td>20.11d</td>
<td>14.58d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital days of care</td>
<td>6.65d</td>
<td>15.51d</td>
<td>11.07d</td>
<td>29.58d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>8.75d</td>
<td>22.20d</td>
<td>12.35d</td>
<td>29.13d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p = .01; †p = .05.
For condition by time interactions, p values for main effects of condition and time are not shown.

n = 80; †n = 75; *n = 74; †n = 73.

Table 3. Health Care Cost Outcomes During a 24-Month Period

<table>
<thead>
<tr>
<th>Variable</th>
<th>8 Months</th>
<th>16 Months</th>
<th>24 Months</th>
<th>Condition</th>
<th>Time</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient cost UPC</td>
<td>1873d</td>
<td>1464d</td>
<td>2533d</td>
<td>2473d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>2326d</td>
<td>1644d</td>
<td>2840d</td>
<td>2947d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient cost UPC</td>
<td>3537d</td>
<td>7208d</td>
<td>5822d</td>
<td>13399d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>4955d</td>
<td>11153d</td>
<td>6373d</td>
<td>15204d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional cost UPC</td>
<td>3537d</td>
<td>7208d</td>
<td>5901d</td>
<td>13461d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>4967d</td>
<td>11202d</td>
<td>7354d</td>
<td>16674d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost UPC</td>
<td>5409d</td>
<td>7923d</td>
<td>8433d</td>
<td>14810d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEM</td>
<td>7292d</td>
<td>11839d</td>
<td>10194d</td>
<td>17770d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p = .01; †p = .05.
For condition by time interactions, p values for main effects of condition and time are not shown.

n = 80; †n = 75; *n = 74; †n = 73.

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of long-term ambulatory care rather than merely a comprehensive assessment with limited or no follow-up.

A number of steps were also taken by the GEM team to minimize costs and to foster the efficient use of health care resources. Most of the direct care was provided by the nurse practitioner, with the geriatrician acting in a consultative role. An emphasis was placed on prevention and health promotion. Care was centralized in the GEM clinic by de-enrolling patients from medical and surgical subspecialty clinics when appropriate. The team was alerted to emergency room use and unexpected inpatient admissions using a customized software program linked to DHCP, and it provided walk-in services to reduce emergency room use. Patients and caregivers were also encouraged to telephone the GEM team with minor questions and problems rather than to schedule an appointment. The GEM team used their knowledge of the patients’ social support systems and baseline functioning to accelerate discharge planning.

Measurement

Data were collected by personal interview, from DHCP, and by medical chart reviews. The personal interviews were conducted following randomization and again at 8, 16, and 24 months by an interviewer blind to condition assignment. Mortality, utilization, and cost data were collected in three 8-month increments.

Health and Functional Status. — Health status was measured by the Medical Outcomes Study Short-Form Health Survey (SF-20; Stewart, Hays, & Ware, 1988) and survival. The SF-20 assesses six dimensions of health: health perceptions, pain, physical functioning, role functioning, social functioning, and mental health. It has been shown to have good reliability and validity (Hays & Stewart, 1990). Information about survival was provided by DHCP. Deaths were confirmed using hospital discharge summaries and death certificates. Changes in functional status were measured by the 18-item Functional Independence Measure (FIM), a reliable and valid measure of functional disability in adults (Granger & Hamilton, 1992; Granger, Hamilton, Keith, Zielezny, & Sherwin, 1986; Linacre, Heinemann, Wright, Granger, & Hamilton, 1994).

Outpatient Utilization. — DHCP provided data on VA outpatient resource utilization as well as any non-VA utilization paid for by the VA. Outpatient utilization variables included the number of: (a) UPC or GEM clinic visits, (b) medicine clinic visits, (c) surgery clinic visits, (d) emergency room visits, and (e) total clinic visits. Total clinic visits is the sum of the first four outpatient utilization variables plus the number of visits to ancillary, dental, diagnostic, dialysis, prosthetics, psychiatry, rehabilitation, and substance abuse clinics.

Inpatient Utilization. — Inpatient utilization data were also abstracted from DHCP. Variables included: (a) total number of hospital admissions, (b) hospital days of care, (c) nursing home admissions, and (d) nursing home days of care.

Cost of Care. — Five variables were computed to measure health care costs: (1) total outpatient cost, (2) total inpatient cost, (3) nursing home cost, (4) total institutional cost, and (5) total health care cost. Total outpatient cost is all costs associated with VA outpatient services. This includes clinic visits, diagnostic services, medications, home care equipment, prosthetics, ambulatory surgery, home care, and adult day health care. Total inpatient cost includes hospital overhead, attending medical staff, inpatient diagnostics, medications, surgical procedures, and inpatient rehabilitation. Total nursing home cost includes stays in both VA nursing homes and VA contract nursing homes. Total institutional cost includes total inpatient costs plus total nursing home costs. Total health care cost is the sum of total outpatient, inpatient, and nursing home cost.

In the VA health care system, costs for services are calculated using the Cost Distribution Report (CDR; Chapko, Ehreth, & Hedrick, 1991). Costs include workload, salary, and associated supply and overhead for each health service (e.g., medicine clinic or inpatient medical intensive care). To calculate the cost variables in this study, each unit of care (e.g., clinic visit or bed-day of care by ward) was aggregated by patient, and then weighted by the unit cost specified in the CDR. For care and equipment provided by VA contract personnel, costs were abstracted from vendor billing records. Because the GEM clinic was created for this study, the actual cost of a GEM visit was not available in the CDR. Therefore, a unique cost for GEM visits was calculated using CDR methodology. The GEM clinic cost $129.10 per visit, while UPC clinics cost $56.02 per visit. This difference was a function of the longer GEM appointments as well as GEM team time spent in care-planning meetings, caregiver assessment and support, telephone care, and inpatient care.

Non-VA Utilization. — The study was designed to collect data about VA health care utilization and cost. However, during personal interviews, patients were questioned about their use of non-VA inpatient, emergency department, and ambulatory care not paid for by the VA that they may have used in the preceding 8 months. Non-VA health care use was found to be minimal, with less than 1% of inpatient, emergency department, and ambulatory care services being received outside of the VA system, and no statistically significant differences were found between the use of non-VA health care services by patients in GEM and UPC.

Data Analyses

Baseline variables were compared using Student’s t and χ² tests. Overall group differences in survival were assessed with a nonparametric log-rank test. Potential subgroup differences in survival were iden-
tified using Cox proportional hazards modeling. Co-
variates included important diagnostic subgroups, 
i.e., chronic obstructive pulmonary disease, dia-
betes mellitus, congestive heart failure, and hyper-
tension, FIM functional status scores, and SF-20 health 
status scores. To test for the effects of condition, 
time, and condition by time interaction, outcome 
variables were analyzed using random regression 
models. In these models, condition by time interac-
tions suggest that the utilization and cost of services 
were changing differently in the two groups during 
the study. Random regression models offer several 
advantages over more traditional repeated-measures 
designs or nonparametric tests (Gibbons et al., 1993). 
Our model included adjustments for first-order 
autoregressive error terms, which indicate whether 
the utilization of services in any 8-month period is 
correlated to the prior 8-month time period. In addi-
tion, random regression models allow all 160 patients 
to be included in the analysis, as individuals with 
partial data (i.e., patients who died) are included in 
the model for the time periods in which they were 
avive. Finally, random-subject effects are included 
in the model to control for subject-to-subject differ-
ences. Utilization and cost variables were also 
summed across the 24-month follow up period in 
order to assess the overall cumulative effect of GEM, 
and comparisons were made using a Wilcoxon two-
sample test. If a condition by time interaction is 
present for a given cost variable, but the Wilcoxon 
test of the cumulative effect was nonsignificant, the 
combination of these two findings may indicate 
an investment effect in one of the groups. An attempt 
was made to normalize all non-normally distributed 
variables using square root or log transformations. 
Transformations were not successful for nursing 
home admissions, nursing home days of care, and 
nursing home cost. Therefore, we do not report on 
these variables. Nursing home costs are, however, 
included in institutional cost data, which was suc-
cessfully transformed.

Power calculations have not yet been developed 
for random regression models. However, a conserva-
tive estimate of power for these models may be 
derived from power analysis formulas developed by 
Cohen (1988) for Repeated Measures Analysis of Var-
iance models. The current study has 80% power to 
detect a moderate-effect size (.23) for condition-by-
time interactions for each of the utilization and cost 
variables.

Results

Health and Functional Status

No significant differences were found in SF-20 
health (p values for all subscales > .05) or FIM func-
tional status scores (p > .05) among GEM and UPC 
patients over the 24-month study period. By 24 
months, 18 patients expired in UPC; 12 died while in 
GEM. Although this represents a 7.5% difference in 
survival rates, as can be seen in Figure 1, no statisti-
cally significant survival advantage was found for 
whether there was a survival advantage for patients 
with different diagnoses and health and functional 
status levels, diagnostic groups, FIM scores, and SF-
20 scores were examined for their association with 
survival. There was a significant correlation between 
the SF-20 pain subscale and survival. A subsequent 
subgroup analysis presented in Figure 2 indicates 
that there was a survival advantage approaching sta-
tistical significance for GEM patients reporting no 
pain. Thus, GEM patients who reported no pain (n = 
15) on the SF-20 pain subscale experienced a trend 
toward a survival advantage ($\chi^2 [1] = 3.81, p = .051$) 
as compared to UPC patients who reported no pain 
(n = 17).

Health Care Utilization

Table 2 presents means and standard deviations as 
well as main and interaction effects for health care 
utilization. Significant main effects of condition and 
time were found for emergency room visits and for 
total outpatient visits. As shown in Table 2, GEM pa-
patients used fewer emergency room services than 
UPC patients throughout the study, and use of the 
emergency room declined for subjects in both con-
ditions over the course of the study. Table 2 also re-
veals that GEM patients used significantly more total 
outpatient clinic services than UPC patients, and the 
use of outpatient services declined for subjects in 
both conditions over the course of the study.

Significant condition-by-time-interaction effects 
were found for number of visits to: (a) GEM and UPC 
clinics, (b) medicine clinics, and (c) surgery clinics. 
An inspection of the means presented in Table 2
reveals that GEM patients reduced their use of the GEM clinic by an average of .85 visits, whereas UPC patient’s visits declined by an average of .20 visits. As can be seen, most of the decline in visits to the GEM clinic occurred from 16 to 24 months. Similarly, GEM patients reduced their visits to a medicine clinic by an average of 1.27 visits as compared to .30 for UPC patients, and to a surgery clinic by .64 as compared to .24 for UPC patients. Again, declines in visits by GEM patients to both medicine and surgery clinics were greatest from 16 to 24 months.

Table 2 reveals a significant time effect for hospital admissions. Reflecting continued decline in subjects’ health, hospital admissions rose slightly for patients in both UPC and GEM from 8 to 24 months. Table 2 also reveals a significant condition by time-interaction effect for hospital days of care. An inspection of the means presented in Table 2 reveals that while hospital days of care for the average GEM patient increased only .37 days over the course of the study, hospital days of care for the average UPC patient increased by 11.85 days. While there was a decline in hospital days of care for GEM patients from 16 to 24 months after baseline, there was a sharp increase in hospital days of care for UPC patients.

Health Care Costs

Table 3 presents means and standard deviations and significant main and interaction effects for health care cost. Significant condition and time effects were found for total outpatient cost. An inspection of the means presented in Table 3 reveals that GEM patients incurred significantly more outpatient health care cost than UPC patients over the course of the study. Table 3 also reveals that while total outpatient costs for patients in UPC groups decreased from 16 to 24 months, they increased for GEM patients.

Significant condition by time effects for inpatient, institutional, and total costs also presented in Table 3 reveal that inpatient costs increased during all three time periods for UPC patients, whereas, they declined for GEM patients from 16 to 24 months. Thus, from 16 to 24 months, UPC patients had accrued $5,180 more per person in inpatient costs than GEM patients. A similar pattern of results occurs for total institutional costs. From 16 to 24 months, UPC patients had accrued $5,679 more per person in institutional costs than GEM patients.

In regard to total costs, Table 3 reveals that expenditures increased for patients in both groups from 8 to 16 months. However, while total costs increased sharply for UPC patients from 16 to 24 months, total costs declined for GEM patients. As can be seen in Table 3, from 16 to 24 months, total mean health care costs per person for GEM patients were $5,229 less than for UPC patients. Still, because GEM patients accrued more costs for outpatient and inpatient services than UPC patients during the first 16 months of the study, there were no overall cost savings for GEM patients for the 24-month study period. By the end of the 2-year study, the 80 patients in the GEM condition had accrued $2,067,520 in costs, while the 80 patients in the UPC condition accrued somewhat lower costs — $1,999,600.

Discussion

The significant condition-by-time-interaction effects for inpatient, institutional, and total costs are notable because they provide some evidence for the investment strategy originally postulated by Rubenstein and colleagues (Rubenstein et al., 1984) over a decade ago. In the first eight months of the study, the cost of care for GEM patients exceeded the cost of care for UPC patients by 34.8%. This fell to 20.9% during the second eighth-month period. However, in the final eight months of the study, the cost of care for patients in UPC was 37.8% higher than the cost of care for GEM patients. If this cost differential were to continue, or even plateau, GEM would begin to produce an overall cost savings approximately 2 months after the end of the study, or 26 months after baseline. Because the amount of health care utilization and the cost of care beyond the end of the study is unknown, additional research is needed to confirm the presence of an investment effect.

An investment effect is also suggested by the health service utilization data. On the outpatient side, after a period of increased service use following the comprehensive geriatric assessment, GEM patients experienced a significant reduction in use of the GEM clinic. Reductions were also found in GEM patients’ use of medicine and surgery clinic visits from 16 to 24 months. Similarly, after an increase from baseline to 8 months, GEM patients experi-
enced a reduction in hospital days of care from 16 to 24 months, while hospital days of care for UPC patients continued to increase throughout the study.

Like most previous outpatient GEM trials (Epstein et al., 1987; Rubin et al., 1992; Tulloch & Moore, 1979; Williams et al., 1987; Yeo et al., 1987) the results of this study do not reveal overall significant cost savings for GEM. Still, the results are encouraging because, assuming that the 16- to 24-month trends continue or plateau, enough patients are likely to be alive 3 and 4 years after baseline to realize large cost savings. At the same time, the findings suggest that health care administrators should be cautious about viewing outpatient GEM care as a “quick fix.” The results of this study suggest that start-up costs for GEM will be higher than for UPC, and that a return on investment may occur only after 2 years.

The significant condition effect for total outpatient costs should be interpreted cautiously. One might conclude that higher total outpatient utilization for GEM combined with fewer hospital days of care indicate a substitution of outpatient care for inpatient care. However, the significant condition-by-time-interaction effects for medicine, surgery, and GEM and UPC visits suggest an overall investment effect, not a substitution effect, because visits to these clinics decreased for GEM patients over the 24-month study period.

Not all of the effects of GEM, however, can be attributed to an investment effect. For example, findings of a significant main effect of condition for emergency room services suggests that measures taken in the GEM clinic to divert emergency room use were effective by 8 months, and continued throughout the study period.

The results of this study indicate that significant cost savings from 16 to 24 months were achieved without any negative effects on health or functional status. However, like most previous trials, this study fails to offer conclusive support for the ability of GEM to improve the health status of frail outpatients. Findings indicate that, except for those patients reporting no pain, there was no statistically significant difference between the two-year survival rate of GEM and UPC patients. Also, no significant differences were found on measures of health perception or functional status. In contrast, reductions in the use of some outpatient clinics and fewer hospital days of care suggest that GEM may have had a beneficial effect on patients’ health. It is unclear from this study whether the utilization and cost savings observed in the final study period were the result of the GEM team’s case management and gatekeeping efforts, health status changes, or both.

Although additional research is needed to clarify these relationships, the comprehensive assessment at the beginning of GEM care resulted in the diagnoses of untreated medical problems in this frail population. Indeed, as compared to UPC patients, the data suggest that GEM patients used more diagnostic, medical, and surgery outpatient services, and had more inpatient respite care admissions during the first eight months of the study. These services may have prevented the exacerbation of chronic health problems that led to higher utilization rates and greater costs of care among UPC patients later in the study.

The GEM team’s case management efforts in combination with greater knowledge of patients and their caregivers may have also accounted for reduced utilization and costs during the last study period. The comprehensive assessment and close monitoring of patients and their caregivers over time may have enabled the GEM team to better understand the patients’ psychosocial, health, and functional abilities, as well as the vitality of their support system. Better understanding of the interaction of patients’ medical problems and support systems and greater involvement in discharge planning from inpatient settings may have enabled the GEM team to put the necessary supports in place to enable the patient to be cared for at home even with complicated chronic illnesses. This, in turn, may have contributed to the significantly fewer hospital days of care that were observed for GEM patients in the last study period.

A better understanding of patients’ health- and care-seeking behavior by the interdisciplinary team may have also contributed to the lower utilization rates of certain outpatient clinics. For example, we report elsewhere that the GEM clinic significantly reduced the use of medicine and surgery clinics by patients with elevated scores on a measure of somatization, perhaps because patients’ psychosomatic symptoms were addressed more effectively by the interdisciplinary nature of the GEM team (O’Donnell & Toseland, in press).

There are three limitations that should be kept in mind when interpreting the results of this study. First, the findings are based on only one GEM team. Given the limited number of frail older outpatients willing to participate in a randomized trial in any one setting, a multisite trial will be needed to examine the generalizability of the findings of this study. Second, although the CDR costing methodology is used throughout the VA system and has been used in many studies, costs are site-specific, and budget limitations prevented us from conducting a validity study of CDR costs at the study site. Also, since the CDR aggregates the costs of resources used during a hospital stay to derive a unit cost, any differences that may exist in the intensity of care are not reflected in the cost comparisons. Third, the study was conducted in a VA Medical Center, where inpatient stays tend to be longer than in the private sector (National Academy of Sciences, 1977; Schlesinger, Moran, & Zwangwill, 1984; Wolinsky, Coe, & Mosely, 1987). Admission patterns may differ in non-VA settings. Studies of the effectiveness of outpatient GEMS in Health Maintenance Organizations and other health care organizations are needed.

Longer study periods are also recommended for future trials of outpatient GEMS. Although this study found no overall cost savings during the study period, significant cost savings were found for GEM
from 16 to 24 months. To date, no randomized trials of outpatient GEM have examined effects for more than two years. The findings of this study suggest that a longer follow-up period may help to determine if there are cost savings and health gains from investment effects that only begin to accrue 16 months after the comprehensive assessment and follow-up care provided by an outpatient GEM team.

References


Received December 7, 1995

Accepted July 13, 1996