

The need for special interventions for multiple hospital admission patients

by Gerald M. Eggert and Bruce Friedman

Although a high proportion of Medicare hospital admissions and expenditures are accounted for by a small proportion of the elderly who experience chronic patterns of acute hospital use, little emphasis has been placed on reducing hospitalization among these high users. Five interventions that have succeeded in substantially reducing the number of

hospital days among high users living at home are discussed in this article, as are several interventions that have reduced hospital use by nursing home residents. With the passage of the Medicare Catastrophic Coverage Act of 1988, research and demonstration activities for high users of hospital care will, for the first time, have a Federal focus.

Introduction

Previous attempts to use special interventions (e.g., case management, payment for additional community-based services under Medicare and Medicaid) to reduce health care expenditures have, in general, failed to achieve desired cost savings. Most of these earlier efforts have focused on patients believed to be at high risk of using nursing home services. Interventions targeted at other groups of patients who are at high risk of incurring high-cost episodes of health care should provide greater opportunities for cost savings. One such group is patients at risk of repeated hospital admissions.

More than 30 years ago, Roemer, Myers, and their associates first discovered that a small number of hospital patients experience multiple admissions over time (Roth et al., 1955; Roemer and Myers, 1956). They found that chronic illness was strongly associated with multiple admissions and recommended that cost containment "efforts should be concentrated on these hospital repeaters" (Roemer and Myers, 1956).

Since that time, a number of other studies have recognized the existence of multiple-admission patients and the fact that these patients account for a disproportionately high share of hospital utilization and expenditures. Pareto's Law, the principle that a small amount of people account for a disproportionate amount of activity, applies to Medicare hospital utilization and expenditures. This article reviews the phenomenon of multiple-admission patients and discusses why special interventions might be effective in reducing the number of hospital days and expenditures among Medicare patients who are repeatedly hospitalized. Finally, recommendations are given for research and demonstration programs.

Early studies

Roth et al. (1955) first identified the phenomenon of multiple hospital admissions experienced by a small proportion of hospital patients. Seventeen percent of

admissions in low hospitalization areas and 28 percent of admissions in high hospitalization areas in Saskatchewan in 1952 were repeat admissions of patients previously admitted during that year. Roemer and Myers (1956) followed up this study with an analysis of all hospital admissions of men in Saskatchewan in 1954 who also had one or more hospital stays during the years 1950-53. Eighty-seven percent of the hospital days utilized by this group over the 5-year period were accounted for by 60 percent of the 1954 patients. The other 40 percent used only 13 percent of the hospital days. The multiple-admission patients averaged 54 hospital days over the 5 years. Roemer and Myers also found that the pattern of hospitalizations for the 1954 patients whose most recent hospital admission was for an acute condition was considerably different from that for patients for whom the admission was because of a chronic illness. Although less than one-half of patients whose last admission was for an acute illness experienced more than two admissions during the 5-year period, two-thirds of patients whose most recent admission was for a chronic condition had more than two hospitalizations.

Roemer and Myers (1956) recommended special interventions for these chronically ill multiple-admission patients. "The epidemiological significance of these findings is easy enough to state, but extremely difficult to apply. It means that if we wish to make inroads on the causes of high hospital utilization, and large hospital expenditures, efforts should be concentrated on these hospital repeaters. It means more and more attention required on the effective management in the home and office of the chronic, degenerative diseases" (Roemer and Myers, 1956).

Chronic illness and ambiplex patients

Schroeder, Showstack, and Roberts (1979) and Zook and Moore (1980) analyzed and described hospital patients by level of expenditure. Both studies found that high-cost utilizers are more likely to be persons with chronic health problems who experience multiple admissions over time. Specifically, Zook and Moore found that repeated hospitalizations for the same disease accounted for 50-90 percent of the

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highest-cost 10 percent of patients among 6 populations treated at 5 hospitals during a 10-year period. In a later paper, the study's authors concluded that "high-cost illness is most often longitudinal in nature, comprising a series of treatments and hospital episodes over time rather than one medical emergency" (Zook, Moore, and Zeckhauser, 1981). Although the care for hospital patients with a single cost-intensive illness or a single prolonged hospitalization was very expensive, neither of these was as costly as the care of patients who experienced multiple admissions for the same illness (Zook, Moore, and Zeckhauser, 1981).

Significantly, many elderly people have not just one illness but several chronic illnesses and conditions. When they are admitted to the hospital, they may have a number of comorbidities. A patient may have one principal diagnosis for one admission and a different principal diagnosis for the next. Many of these patients are experiencing multiple systems failure.

Gavett et al. (1985) at Strong Memorial Hospital in Rochester have identified and labeled a new class of patients—ambiplex patients—who are characterized by ambiguity and complexity of diagnosis and treatment. They are "complex by virtue of the multiplicity of their problems and ambiguous because there is no conventional definition or focus for their illness" (Gavett et al., 1985).

They state further that, "the criteria of ambiplex include a set of co-morbidities that are not necessarily interrelated, multiple hospitalizations in terms of admissions, within-admission transfers (encounters) among different clinical services, and long hospitalizations. Patients are likely to be older. The medical problems are largely independent such that intervention to treat one problem simply shifts another to primacy. The prognosis for an overall satisfactory outcome is poor and the likelihood of death, within a relatively short term, is high. The hospital charges for this group of patients are also likely to be high.

"By the time the high cost ambiplex patient is identified his/her prognosis for further useful and enjoyable existence is poor. Although readmission may occur, these are followed by exacerbations. Once ambiplex patients have achieved the status of 'high cost' there is a likelihood of death within a year or

two. Therapy of one disorder has scant beneficial influence on the co-morbidities, and multiple therapies often create iatrogenic complications. These patients pursue a course of recurrent hospitalization, often on a succession of different clinical services with care orchestrated by a host of physicians and surgeons" (Gavett et al., 1985).

Multiple-admission Medicare patients

Guralnick and Resnic (1974) first identified the phenomenon of multiple-admission patients among the Medicare population. They found that almost one-half (46 percent) of all Medicare hospital discharges in 1967 were attributed to patients who were discharged more than once.

Gornick (1977) took this research several steps further by using Medicare data for a 2-year period (1972-73), identifying the intervals between hospital stays, examining causes of hospitalization, and comparing hospitalizations for 10 diagnoses among the States with the highest and lowest proportions of multiple-admission patients. She found that multiple admissions were more prevalent among Medicare patients with chronic, as opposed to acute self-limited, diseases. She also suggested that "[a]n urgent need exists for research . . . to explore ways of changing some of the patterns of delivering services."

Anderson and Steinberg (1984) took the analysis of Medicare multiple-admission patients a few steps further by examining 4 years of data, as well as looking at expenditures. They found that, from 1974 to 1977, 2.6 percent of the Medicare population experienced more than 5 discharges and accounted for 20 percent of Medicare inpatient hospital expenditures; 12.5 percent, who experienced at least 3 hospital discharges, accounted for 58 percent of expenditures.

Gruenberg and Tompkins (1985) found that among Medicare eligibles who remained alive during the 3-year period 1975-77, 19 percent experienced 2 or more discharges, 22 percent were discharged once, and 58 percent were never hospitalized (Table 1). They also estimated the probability of Medicare patients being "chronic" or "nonchronic" users of inpatient hospital care. "Chronic users" are patients who are chronically ill and have a high probability of

Table 1

Frequency distribution of hospital discharges for live persons 67 years of age or over: 1975-77

Item	Number of discharges												
	0	1	2	3	4	5	6	7	8	9	10	11	12+
Number of people	2,253	848	347	169	83	50	18	17	7	6	3	2	2
Percent of total people	58.2	22.3	9.1	4.4	2.2	1.3	0.5	0.4	0.2	0.2	0.1	0.1	0.1

NOTE: Total number of people = 3,805. The total percent of people experiencing 2 or more discharges is 18.6 percent.

SOURCE: (Gruenberg and Tompkins, 1985).

experiencing multiple hospital admissions over time. "Nonchronic users" are people who are generally well and are hospitalized only for acute, self-limiting conditions. The assumption was made that all persons with zero or one hospitalization over the 3-year period were nonchronic users. The Poisson distribution was then used to estimate the expected number of hospital discharges of nonchronic patients. This distribution was used because it is reasonable to expect that hospitalizations of nonchronic users will be reasonably independent and that the probability of a hospital admission occurring will be "directly proportional to the length of time of observation" (Gruenberg and Tompkins, 1985). The number of chronic users was calculated by subtracting the actual number of nonchronic users from the total of chronic and nonchronic patients. Proportions were then calculated using these figures. Gruenberg and Tompkins estimated that 54 percent of patients with 2 discharges and 88, 98, and 100 percent of patients with 3, 4, or 5 or more discharges, respectively, over the 3-year period were chronic users. The 14 percent of all Medicare enrollees who comprised the chronic group of multiple-admission survivors utilized 45 percent of total Medicare expenditures in 1977.

More recently, Riley et al. (1986) examined the issue of whether Medicare expenditures have become more concentrated among the small proportion of heavy users over time. They found that expenditure distribution was very stable for the 3 years examined (1969, 1975, and 1982). In each of the 3 years, which occurred in 3 different decades, a small proportion of patients accounted for a large percentage of expenditures. In 1982, 4 percent of enrollees accounted for 48 percent of total Medicare expenditures, averaging \$17,897 per person. The top 2 percent of enrollees averaged \$23,818 per capita. The persistence of this pattern over time is important, because a strategy of special interventions makes sense only if there will continue to be a high-utilizer population.

The third of the three patient groups identified by Gruenberg and Tompkins is the nonsurvivors. A number of studies have found health care expenditures to be considerably higher during the last few years of life (Scitovsky, 1984; Lubitz and Prihoda, 1984; McCall, 1984; Roos, Montgomery, and Roos, 1987). This phenomenon is closely related to the "concept of predeath" identified by Isaacs et al., (1971), a state of ill health that exists for a somewhat lengthy period of time prior to death. The presence of the predeath state presumably distinguishes the high-utilizer nonsurvivors from the non-high-utilizer nonsurvivors, people who die suddenly and without great cost to the health care system.

Regression toward the mean

An important and controversial area of concern regarding high utilizers involves regression toward the mean, the tendency of people who are high or low

users of health care in a given year to move toward average use over time. Whether regression toward the mean occurs and, if it occurs, the degree to which it takes place, occupies a pivotal position regarding special interventions for high-cost patients. If high-cost cases regress greatly toward the average in a short period of time, special interventions have limited opportunity to reduce health care expenditures.

There is lack of agreement regarding regression toward the mean and the degree of persistence of use by high users of health care. What appears to one researcher as persistence of a substantial number or proportion of high utilizers over time may appear to another to be regression toward the mean. There is also lack of agreement regarding what level of change constitutes regression toward the mean as well as the minimum threshold to define high utilizers.

Several studies have found that only a small proportion of elderly high utilizers in a given year are also high users the following year or years. McCall and Wai's (1983) examination of the Medicare population in Colorado found that only 18 percent of high users of inpatient hospital care (75th percentile of inpatient days and over) were also high users the next year. Anderson and Knickman (1984) investigated a random sample of 205,000 Medicare beneficiaries alive throughout the period 1974-77. Only 10 percent of the highest utilizer group (more than \$10,000 in expenditures) during the first year were also high users in the second. In Manitoba, Canada, Shapiro and Roos (1986) found that among 195 elderly high utilizers of hospital days in a given year (31 or more days), 13 percent were high users in 2 of the next 6 years, and an additional 8 percent were high utilizers at least 3 of the next 6 years.

A few other studies have concluded that significant regression toward the mean occurs among Medicare high utilizers. In analyzing Anderson and Knickman's (1984) data, Welch (1985) found that the high users (in this case those with more than \$5,000 in expenditures in the first year) regressed from 1,645 percent above the mean in 1974 to 298, 230, and 178 percent above the mean during each of the next 3 years, respectively. Lubitz, Beebe, and Riley (1985) also found very large regression toward the mean among high-cost Medicare enrollees age 65 or over. The average expenditure of the highest cost group in 1974 (\$690 per capita, 168 percent of the mean) regressed to 121 percent of the mean in 1975, 113 percent in 1976, and 108 percent in 1980.

On the other hand, a number of studies have reported that patterns of high use persist over time for a substantial number of high users. These studies include most of the hospital and Medicare studies cited above as well as research on health maintenance organization (HMO) enrollees (Densen, Shapiro, and Einhorn, 1959; Mullooly and Freeborn, 1979; McFarland et al., 1985; Freeborn et al., 1987). McFarland et al. (1985) determined that, for Kaiser Portland enrollees, "[e]ach consecutive year of high utilization increases one's chances of remaining a high user in the subsequent year." They calculated that an

individual with two consecutive high-use years had a 65-percent probability of remaining a high user the third year. A person with 3 years of high use had a 70-percent chance of being a high utilizer in the fourth year. Anderson and Knickman (1984) determined that the probability of high utilizers being high users the following year was 20 times the probability of non-high users becoming high utilizers the subsequent year. This probability declined only slightly the following 2 years. Therefore, it appears that although most high-cost users regress toward the mean, a substantial minority remain high-cost users.

The most recent study regarding regression toward the mean was conducted by Beebe (1988) using a 7-year period (1974-80) of the Continuous Medicare History Sample. This examination is more discriminating than the prior studies, because it analyzes regression toward the mean among various subgroups of the Medicare population. Although Beebe found regression toward the mean regarding total Medicare reimbursement for strata of beneficiaries grouped by prior reimbursement and by prior utilization, "none of the groups [formed on demographic characteristics] show any appreciable tendency to regress toward the mean." Beebe suggests that demographic characteristics can identify groups that are healthier than average or have a higher than average proportion of persons with chronic conditions. Beebe's finding ties in directly with Gruenberg and Tompkins' (1985) identification of chronic survivors and nonchronic survivors. The critical issue is how to distinguish the chronically ill whose use will remain high and will not appreciably regress toward the mean from the majority whose utilization will regress toward the mean.

Special interventions

We believe that the best way to reduce the number of hospitalizations among patients at risk of experiencing multiple hospital admissions is to develop special interventions that aim to do just that. Special interventions for high-risk or high-cost patients (e.g., high-risk obstetrical patients) have been developed for several State Medicaid programs (Spitz, 1988), chronically mentally ill persons in a few communities (Mechanic and Aiken, 1987), and a number of diagnostic categories (e.g., neonatal complications, spinal cord injury, stroke, and mental illness) of persons insured by a growing number of employer-sponsored health plans (Henderson et al., 1987). However, it appears that no special interventions have been developed to reduce the number of hospital admissions among Medicare patients at risk of experiencing repeated hospitalizations.

For special interventions to be successful, they will have to include the identification of high-risk patients, close monitoring of these patients through case management, and provision of subacute care in nonhospital settings (i.e., at home or in nursing homes). Although we are unaware of any studies that

have attempted to do what we are proposing for patients living at home, a number of studies and interventions suggest that our approach is feasible. There are several programs that have used various approaches to reduce the number of hospitalizations among nursing home residents.

Targeting high utilizers

Developing and carrying out an intervention of this type entails several steps. The first is to identify patients who are high utilizers of hospital care. This requires the targeting of two groups: the chronic survivors as well as the high-utilizer nonsurvivors.

Few of the recent interventions and demonstrations of the past 20 or 30 years have predominantly or exclusively served high users of hospital care (Table 2). This is the case with capitated programs, the in-home and community-based care demonstrations, and geriatric assessment and/or followup units. Of the capitated programs, health maintenance organizations, the four social health maintenance organization demonstration programs and On Lok Senior Health Services, all enroll predominantly low or average utilizers of hospital care. Among the "most rigorous and generalizable" in-home and community-based care programs, one finds that only a few of the studies did in fact serve people who experienced very high hospital use (Weissert, Cready, and Pawelak, 1987). This occurred because the reduction of hospital use was a main objective of only three of the demonstration programs—Project OPEN and San Diego Long-Term Care (Kemper, Applebaum, and Harrigan, 1987) and ACCESS:Medicare. Consequently, many of the demonstrations served populations with low-to-moderate annual rates of hospital use. Among the seven geriatric assessment and/or followup studies for which data are available on hospital use, only one cared for very high users of hospital care.

The number of hospital days per person per year for 25 in-home and community-based care and 8 geriatric assessment and/or followup studies for which hospital utilization data are available, are shown in Table 2. We present data on number of hospital days rather than hospital admissions because information on the latter is not available for all studies. Six provided care to patients who on average had very high hospital use (36-60 days per person per year); 9 cared for persons using a high number of hospital days (15-27 days per year); 11 served people with moderate hospital utilization (5-14 days); and 7 included patients who on average had low hospital use (4 or fewer days).

The 6 demonstrations or studies that experienced very high hospital utilization (more than 35 hospital days per patient per year for the control or comparison group) are shown in Table 2. The reductions in hospital use that occurred among the six programs as well as their cost effectiveness are discussed in the following section.

Reducing hospital use

The second component of a successful intervention for multiple-admission patients is the ability to substantially reduce hospital use. A number of programs have been able to achieve substantial reductions compared with control/comparison groups.

HMO's have been able to accomplish major reductions in hospital utilization, often 25-40 percent (Luft, 1978). However, the vast majority of HMO enrollees are at low risk of hospital use, and the average number of hospital days used by these enrollees is quite low. This is true of Medicare enrollees as well as the nonelderly. A recent evaluation of 20 TEFRA (Tax Equity and Fiscal

Responsibility Act) HMO's found that their enrollees averaged only 2.2 hospital days per person per year (average use per plan ranged from 1.4 to 3.8 days) (Langwell et al., 1987). It also appears that HMO's have not generally developed interventions designed to reduce hospital admissions for persons who are high utilizers of hospital care or who are at high risk of using such care. We have been unable to locate in the literature any special interventions that have been conducted by HMO's that focus on high utilizers. In all likelihood, there are very few, if any, special interventions for multiple-admission patients being carried out by HMO's (Luft, 1988; Freeborn, 1988; Iversen, 1988).

Table 2

Hospital use among home care, community-based care, and geriatric assessment and/or followup studies and demonstrations: 1964-88

Name of study or demonstration	Hospital days per person per year for control/comparison group	Treatment group use compared with control/comparison group use
	Number	Percent
Very high hospital use		
ACCESS:Medicare (Medicare/Medicaid Group)	60.1	- 78
ACCESS:Medicare (Medicare/Private Pay Group)	59.0	- 26
Bristol, England, Acute Stroke Study	50.4	- 2
Rochester, New York, Home Health Care Team	39.5	- 38
Johns Hopkins Post-Hospital Support	38.4	- 24
Sepulveda VA Geriatric Evaluation Unit	36.4	- 42
High hospital use		
Channeling Financial Model	26.8	- 4
ACCESS Neighborhood Case Management Team	26.0	- 26
South Carolina Community Long-Term Care	20.0	- 10
Channeling Basic Model	19.8	- 3
Monroe Community Hospital Geriatric Ambulatory Consultative Service	18.9	- 40
Nursing Home Without Walls (NYC)	16.2	+ 9
National Center for Health Services Research Homemaker	16.0	+ 12
Nursing Home Without Walls (Upstate)	15.9	+ 17
New York City Home Care	14.9	- 25
Moderate hospital use		
Chicago Five Hospital Homebound Elderly	14.0	- 11
National Center for Health Services Research Day Care	13.0	- 23
Chronic Disease	11.6	+ 5
Benjamin Rose Hospital Home Aide	11.4	- 40
San Diego Allied Home Health Care	9.1	- 6
Roesdovre, Denmark, Preventive Visiting	7.5	- 24
Alarm Response	6.6	- 4
Highland Heights	6.4	- 8
White River Junction VA Outpatient Continuity	6.1	- 38
On Lok Senior Health Services	5.4	- 13
Congestive Heart Failure	5.4	+ 2
Low hospital use		
Middleton VA Geriatric Evaluation Unit Followup	4.2	+ 55
Worcester Home Care	4.0	0
Georgia Alternative Health Services	4.0	+ 50
Triage	3.4	+ 118
Oxford, England, Geriatric Screening and Surveillance	2.0	- 29
Kaiser Portland Home Care and ECF Program, Age 65 or over	1.8	- 26
Palo Alto VA Geriatric Clinic	1.5	+ 50

SOURCES: (Hospital Days from Table 5 in Weissert, Cready, and Pawelak, 1987, and from Berkeley Planning Associates, 1987; Zimmer, Groth-Juncker, and McCusker, 1985; Rubenstein et al., 1984; Eggert et al., to be published; Williams et al., 1987; Hendriksen, Lund, and Stromgard, 1984; Wasson et al., 1984; Kerski et al., 1987; Tulloch and Moore, 1979; Hurtado et al., 1972; and Yeo et al., 1987; Treatment group use calculated from Tables 5 and 6 in Weissert, Cready, and Pawelak, 1987, and from the other studies listed above).

The opportunity to reduce the number of hospital days, as well as the likelihood of generating significant dollar reductions, seems greatest among those who experience the most hospital use. Among the 33 studies in Table 2:

- Five of the six studies serving very high utilizers of hospital care achieved substantial reductions in hospital days, ranging from 24 to 78 percent.
- Six of the nine studies caring for patients who were high users of hospital care experienced reductions in hospital days. Three of the studies that achieved decreases had reductions of 25, 26, and 40 percent.
- Nine of the 11 studies that included moderate utilizers of hospital care had lower use. Four experienced large decreases, ranging from 23 to 40 percent.
- Four of the seven studies caring for patients who were low utilizers of hospital care had very large increases in hospital days, ranging from 50 to 118 percent. Two achieved large decreases (26 and 29 percent).

Of the studies whose patients were very high users of hospital care, only one, the Acute Stroke Study (Wade et al., 1985) with a reduction of only 1 hospital day per patient per year, failed to achieve a large reduction.

The most notable study in terms of identifying patients at very high risk of hospital use as well as achieving reductions in that use is ACCESS:Medicare (Berkeley Planning Associates, 1987). The Medicare/Private Pay treatment group used 42 days per year (26 percent fewer), and the Medicare/Medicaid treatment group used only 13 days (78 percent fewer). For the Medicare/Private Pay group, the number of admissions increased by 20 percent (from 1.5 to 1.8). This was more than canceled out by a decrease in average length of stay (ALOS) of 39 percent (from 18 to 11 days). Data on admissions and ALOS were not available for the Medicare/Medicaid group.

The Home Health Care Team (Zimmer, Groth-Juncker, and McCusker, 1985) consisted of a physician, nurse, and social worker, all with special expertise in geriatric care, who provided primary care at home to homebound chronically or terminally ill elderly. The Team was successful in reducing hospital use, the treatment group being hospitalized for only 24 days per person per year, 38 percent fewer than the control group (39 days). The treatment group experienced both a lower admission rate (15 percent less) and a shorter ALOS (12 percent less).

The Post-Hospital Support Program (Oktay and Volland, 1986) whose purpose was to support caregivers of very frail inner-city elderly following their acute hospitalization, reduced hospital utilization by 24 percent (from 38 to 29 days per patient per year). Both average length of stay of the initial hospital admission (when the patients entered the study) and subsequent hospital use were reduced.

The Supelveda Veterans Administration Medical Center conducted a randomized controlled trial (Rubenstein et al., 1984), which evaluated specialized geriatric care for hospitalized patients whose acute

problems had stabilized. Treatment group members were assessed and treated by an interdisciplinary team in a 15-bed geriatric evaluation unit on an intermediate care ward. After discharge, the patients received followup care from a geriatric medical outpatient clinic. Control group patients were cared for in the usual manner in the acute care wards until discharge, after which they were eligible to receive all outpatient services other than the geriatric medical outpatient clinic. The eligibility criteria were designed to enroll only those patients for whom the intervention was anticipated to be successful. Only 8.5 percent of all patients who were screened entered the study. Treatment group patients used an average of 42 percent fewer intensive care and acute care hospital days per patient per year than control group members (21 days, as compared with 36).

Three studies involving high users of hospital care (15 to 27 days per person per year) achieved hospital reductions of 25 to 40 percent compared with control/comparison groups.

- Medically unstable geriatric patients living at home assessed by a multidisciplinary team in an outpatient clinic at Monroe Community Hospital in Rochester, New York, used 40 percent fewer hospital days in comparison to patients assessed by internists with good reputations for geriatric care (Williams et al., 1987).
- In the ACCESS study, comparing two models of case management for skilled-nursing-level patients living at home, the neighborhood team model used 26 percent fewer hospital days than the centralized brokerage model (Eggert et al., 1988).
- The New York City Home Care Project, which provided assessment, care planning, and case management by an interdisciplinary team, coordination of community resources, and delivery of critical gap-filling services to homebound, chronically ill elderly, reduced hospital days by 25 percent, compared with a matched comparison group (City of New York, 1984).

Four studies including moderate users of hospital care (5 to 14 days per person per year) experienced decreases in hospital days ranging from 23 to 40 percent.

- The provision of home aide service to patients not requiring intensive skilled nursing or custodial care, who were discharged from a geriatric rehabilitation hospital (the Benjamin Rose Hospital in Cleveland, Ohio) resulted in 40 percent fewer hospital days compared with the controls (Nielsen et al., 1972).
- Elderly men at the White River Junction Veterans Administration (VA) Hospital who received continuity of outpatient care used 38 percent fewer hospital days than patients who experienced discontinuous care (Wasson et al., 1984).
- Community-dwelling elderly persons age 75 or over in Roedovre, Denmark, who received quarterly in-home assessments as well as application for and coordination of community services, utilized 24 percent fewer hospital days than those receiving

care in the usual patient-initiated way (Hendriksen, Lund, and Stromgard, 1984).

- When adult day care was provided to persons eligible for Medicare who required health care services to restore or maintain functional ability (National Center for Health Services Research Day Care Experiment), the number of hospital days used was 23 percent lower than for the control group when missing or contaminated cases were excluded (Weissert et al., 1980).

Cost effectiveness

It is not sufficient to merely reduce hospital utilization. This reduction must be achieved in ways such that overall health care expenditures are not increased and quality of care is not compromised. Most of the studies listed in Table 2 were not cost effective. However, four of the six studies whose subjects were very high users of hospital days appear to be cost effective.

Although ACCESS:Medicare was able to substantially reduce hospital use, it was cost effective in terms of public expenditures for the dually eligible (Medicare/Medicaid) group but not for the Medicare/Private Pay group. Although not statistically significant, public expenditures were a substantial \$206 (8 percent) less per patient per month for the treatment group. On the other hand, ACCESS:Medicare cost an additional \$771 (49 percent) per patient per month for the Medicare/Private Pay group, because of greatly increased use of waived home care and nursing home services (Berkeley Planning Associates, 1987).

Total health care expenditures in the Home Health Care Team study were 9 percent lower for treatment group patients than for control group patients, although this was not statistically significant (Zimmer, Groth-Juncker, and McCusker, 1985).

For the Post-Hospital Support Program, preliminary data from the evaluation estimate that treatment group expenditures were 13 percent lower than control group costs (Oktay and Volland, 1986).

For the Sepulveda VA Geriatric Evaluation Unit study, institutional VA costs per year survived were 19 percent lower for the treatment group (Rubenstein et al., 1984).

Nursing home interventions

Several studies have shown that substantial proportions of nursing home patients transferred to hospitals also experience multiple hospital admissions (Irvine, Van Buren, and Crossley, 1984; Gordon, Kane, and Rothenberg, 1985; Tresch, Simpson, and Burton, 1985; Barker et al., 1987).

A number of studies have attempted to improve the quality of care delivered in nursing homes. Several of these have also resulted in significant reductions in hospital use by nursing home patients.

Three nurse practitioners/physician assistants and 0.3 physician from a group practice of physicians and

midlevel practitioners (the Urban Medical Group) provided care to an average daily census of 358 nursing home patients in 10 facilities, one-quarter in skilled nursing facilities (SNF's) and three-quarters in intermediate care facilities (ICF's). The physicians in the group practice were responsible for making the decision to hospitalize and admitted the nursing home patients as their private patients. The nursing home patients used significantly fewer (45 percent) hospital days per 1,000 patients per year than a similar nursing home population in Boston surveyed a few years earlier (3,955 days as compared with 7,198) (Mark, Willemain, and Master, 1976). The number of hospital admissions was also substantially lower (28 percent) for the patients cared for by the physician/midlevel practitioner group practice—338 as compared with 467 admissions per 1,000 patients per year (Master et al., 1980).

The Urban Medical Group also carried out two other studies, reported in one paper (Mark et al., undated). The first study compared 479 patients in 13 nursing homes who were cared for by the physician/nurse practitioner group practice with 449 patients in 8 matched nursing homes who received care from community physicians. Three-quarters of each group were residents of ICF's and one-quarter lived in SNF's. The number of hospital days was significantly lower (28 percent) for patients cared for by the physician/nurse practitioner group practice (5,253 days per 1,000 patient years as compared with 7,257 for patients cared for by the community physicians). The number of admissions was also substantially lower (20 percent) for the group practice patients (397 admissions per 1,000 patient years as compared with 495). The total cost per day of hospital and ambulatory care was estimated to be slightly greater (3 percent) for the group practice patients than for the comparison group.

The second study reported in Mark et al. (undated) is a retrospective study in 1 nursing home comparing 70 patients who received care from the nurse practitioner/physician group with 98 patients who received care from community physicians. In contrast to the previous two studies, two-thirds of the patients in each group were SNF residents and one-third were ICF level. As with the previous studies, however, the patients who received care from the nurse practitioner/physician group used significantly less hospital care. This was the case both for number of hospital days (9,543 per 1,000 patient years versus 22,667 for the control group, 58 percent fewer), as well as the number of hospital admissions (682 per 1,000 patient years as compared with 954 for the control group, 29 percent fewer). The total cost per day of hospital and ambulatory care was estimated to be 46 percent less for the patients cared for by the nurse practitioner/physician group: \$13.57 versus \$24.91.

A third significant study is the Sudden Decline Pilot Study (Zimmer et al., 1988) that we carried out under ACCESS:Medicare. Nursing home patients whose condition was "suddenly declining" and for whom

transfer to a hospital seemed likely during the following week were eligible for the Sudden Decline Benefit. ACCESS:Medicare would pay for an assessment of the patient by nursing home staff as well as a physician workup of the patient in the SNF. If both the physician and the nursing home agreed that the patient could be appropriately cared for in the SNF, ACCESS:Medicare would reimburse the facility at a higher rate to enable them to provide the increased nursing care required. The Sudden Decline Benefit also paid a higher rate for physician visits to the nursing home and would pay for visits on a daily basis if necessary.

The evaluation (a retrospective audit by a physician panel of the first 112 patients to use the benefit) found that 67 of the patients (60 percent) avoided a certain or likely hospital admission. Another 18 patients (16 percent) avoided a probable emergency room visit, and 14 (12 percent) required additional acute care in the SNF. Only 13 patients (12 percent) inappropriately received the benefit.

The pilot study estimated savings to Medicare of \$3,000 per case. For patients also eligible for Medicaid, additional savings of \$1,000 per case were estimated. The Medicaid savings resulted from the elimination of the necessity to pay for nursing home "bed holds" while the patient was in the hospital (Zimmer et al., 1988).

Research and demonstration recommendations

A few salient points from the preceding review bear repeating. First, a small proportion of persons account for the bulk of inpatient hospital expenditures. Second, the patients accounting for the bulk of these expenditures are chronically ill and experience a number of hospital admissions over a period of several years. This period of multiple hospital admissions is often followed by the death of the patient. Third, a number of different programs caring for patients experiencing very-high-to-moderate hospital use have significantly decreased the number of hospital days. On the other hand, interventions whose control/comparison group use was low often experienced substantially greater hospital use among treatment group members. Fourth, of the six programs that served very high users and were able to significantly reduce hospital use, four were cost effective. Fifth, several other interventions substantially decreased hospital use of nursing home patients.

Research and demonstration programs should be conducted to identify the best ways to reduce the number of hospital admissions and days used by persons at risk of high utilization. Research is needed both for persons living at home and for those in institutions. The goal of further research should be to identify the specific subgroups at highest risk, as well as the range of interventions that are most likely to improve cost and quality outcomes.

For special interventions to be successfully designed

and carried out, additional information is required on the following:

- The types of multiple-hospital-admission patients and other high users, the diseases and conditions they have (many chronically ill elderly suffer from several), and their demographic characteristics, functional status, and service needs and use.
- How diseases and conditions, functional status, and service needs and use for different types of high utilizers change over time, and how their care should be managed.
- The distribution and amounts of various health care services being received by multiple-hospital-admission patients/high users living at home, and how these compare with those received by low utilizers.
- Whether, and if so, how, the hospitalization patterns of long-term home care patients differ from those of chronically ill persons living at home but not receiving home care.
- The use of hospitals by nursing home patients over time, including information on how some facilities care for various types of patients within the nursing home.

Models need to be developed, tested, and implemented for managing the care of patients over time (their "health careers") as their diseases or conditions become more severe, their functional status deteriorates, and they move back and forth from one in-home or out-of-home setting to another. This is especially important as health care utilization and expenditures are considerably higher during the last 3 or 4 years of life and usually increase as the patient approaches death.

The studies reviewed in this article that achieved significant reductions in hospital use are good models for replication or refinement or as the basis for more sophisticated models. Those models that have been found to be most successful in reducing hospital use should be closely examined to determine the common features or common aspects of programs that might have been especially successful with certain patient subgroups.

There is a noticeable absence of reliable estimates of the proportion of hospital readmissions that are preventable, although one British study (Graham and Livesley, 1983) estimated that 47.8 percent of readmissions to an inpatient geriatric service from the community were preventable. Also, a Monroe County, New York, study estimated that 40 percent of hospital admissions by nursing home residents were preventable (Van Buren et al., 1982).

Different diagnosis groups have been found to have different rates of hospital readmission (Gooding and Jette, 1985; Smith, Norton, and McDonald, 1985). Presumably, different types of special interventions would have different effects among various groups of patients. Specific models should be developed and tested for targeted groups. Clearly, targeting and cost effectiveness are crucial to the success of special interventions for high utilizers of hospital care.

Common sense as well as the existing evidence

strongly suggest that hospitals are the best location to identify high utilizers. Five of the six studies of very high users of hospital care discussed in this article obtained study participants predominantly or exclusively from hospitals. Prior use has been found to be the best single predictor of future utilization (Lubitz, 1987). A number of statistically significant predictors of hospital readmissions have been identified (Anderson and Steinberg, 1985; Fethke, Smith, and Johnson, 1986). Although more basic research is desirable for the longer term, existing information from these and other studies is sufficient to initiate demonstration programs for multiple-hospital-admission/high-utilizer patients at the present time.

Targeting and service use are directly related to cost effectiveness. Enrolling high utilizers will not be sufficient by itself to ensure cost effectiveness. The volume of services patients are eligible to receive must also be appropriately limited. The only eligibility criteria for ACCESS:Medicare were that patients require skilled-level care and that they required this level of care for at least 90 days. These criteria were sufficient for the demonstration to be cost effective for the Medicare/Medicaid group, but not for the Medicare/Private Pay group. The volume of post-acute services received by the latter group more than offset the reduction in acute inpatient use. Further research is required to determine the appropriate level of various services needed to achieve reductions in hospital use so that reductions are achieved in a cost-effective manner. We also need to better understand how the organization and management of service delivery provided in different models results in various outcomes (mortality, morbidity, functional status, quality of life, service utilization, expenditures, and quality of care) for specific types of patients.

Based on the literature and our experience in Monroe County, interventions most likely to reduce hospitalizations among persons living at home will have to combine aspects of the geriatric assessment and followup models (for example, Rubenstein et al., 1984; Williams et al., 1987), with features of the team case management models developed in Monroe County, New York, for terminal (Zimmer, Groth-Juncker, and McCusker, 1984) and high-cost patients (Eggert et al., to be published). Treatment protocols should integrate medical and nursing care with a strong social component to support the family and informal caregivers. Caution should be exercised in the use of supplemental in-home and community services, and the focus of additional services must be on respite and caregiver support. New intervention models should try to avoid repeating the disappointing outcomes of earlier community care studies (Kemper, Applebaum, and Harrigan, 1987; Weissert, Cready, and Pawelak, 1987), in which additional service dollars more than consumed savings on institutional care. The better use of long-stay hospital beds and/or residential health care facilities (Rubenstein et al., 1984; Zimmer et al., 1988) and congregate housing settings (Morris et al., 1987) as substitutes for hospital

use should be vigorously tested. Overall cost effectiveness should be pursued through the use of realistic social break-even analysis or prospective budgeting models (Weissert, Cready, and Pawelak, 1987).

Strategies to reduce inappropriate hospital use by Medicare beneficiaries residing in nursing homes present unique issues of targeting and cost effectiveness (Ouslander, 1988). Research efforts could include making available to nursing homes more on-call personnel trained to handle acute situations, providing a wider range of diagnostic and treatment services, and reimbursing nursing homes for acute-level services. The development and financing of infirmaries or acute care sections in nursing homes might better integrate these facilities into the medical care system, as well as reduce readmissions to hospitals and ease the transition from hospital to nursing home when return to the community is not feasible.

The demonstrations of high-cost case management strategies called for in the Medicare Catastrophic Coverage Act of 1988 will provide a Federal focus for research and demonstration activities for high hospital utilizers. It is time to develop and test special interventions to reduce hospital use among multiple-admission patients, as first recommended by Roemer and his colleagues over 30 years ago.

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