

What Price an Additional Day of Life? A Cost-Effectiveness Study of Case Management

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Abstract

Objective: To examine the costs and benefits of a case-management program for an elderly, functionally impaired population in a managed care setting.

Study Design: A post hoc, cost-effectiveness study of case management.

Subjects and Methods: As part of a larger study, 317 elderly, functionally impaired clients were randomly assigned to a case-managed or regular-care group. During the 2-year study period, 34 clients in the case-managed and 43 clients in the regular-care group died. A post hoc analysis of the difference in average total cost per person, death rates, and average number of days of exposure per person were assessed to determine the cost per life saved and cost per additional day of life.

Results: Although the average costs for the case-managed group were greater than the costs for the regular-care group, clients in the case-managed group lived an average of 106 days longer. The cost per additional day of life was \$40. The difference in death rates was so small that, by extrapolation, the cost per life saved was over \$42 million.

Conclusion: Although the case-management program was more costly when viewed from a purely fiscal perspective, it may very well be considered a success when its benefits are evaluated. The case-

management program improved quality and was associated with prolonged life at a cost of \$40 per day of additional life. Additional research involving other patient populations, study settings, and case-management models is warranted.

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Case management is a common approach to constraining healthcare costs.¹⁻¹² The specific objectives of case management may vary. As a result, there are many different case-management models, and each model has different dynamics. Although a simplification, the models can be categorized into 2 distinct types: interrogative and patient advocacy.^{5,7,10} The *interrogative model* emphasizes cost effectiveness via intense fiduciary oversight during the initial clinical decision-making process, ie, prior authorization. This model, also referred to as the medical case-management model,⁵ employs a physician gatekeeper to coordinate services. The *patient advocacy model* emphasizes more comprehensive coordination of services over the continuum of care from the client perspective. This model, also referred to as the socioeconomic model,⁵ employs a broker rather than a health professional and aims to improve quality of care. With the patient advocacy model, there is also an expectation that lower-cost services will be used when possible.

In long-term care, a third *consolidated* model may also be used.⁷ In this model, a multidisciplinary team of providers assesses the changing needs of the client and provides the services. In one study, researchers found that a consolidated case-management model—the On-Lok Senior Health Services in

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San Francisco, California—had service costs lower than those of many brokerage models.^{7,12}

The interrogative model of case management addresses quality through the cost variable, while the patient advocacy model addresses quality through the benefit variable. It has been suggested that quality is a measure of the extent to which the care maximizes health benefit while minimizing risk, and that costs play a vital role in the quality of care.¹³ According to Donabedian, quality of care can be measured as follows: quality = benefits - (risk + cost).¹³ Given this definition, both the interrogative and patient advocacy case-management models address quality of care. By definition, if costs and risk remain constant and benefits increase, quality improves. Similarly, if benefits and risk remain constant and costs decrease, quality improves. Regardless of the rationale of a case-management program, the inherent dynamics of the model will determine if the ultimate effect is cost savings or benefit improvement.

This definition of quality also suggests that a case-management program that fails to reduce costs is not an a priori failure. The possibility that the program increased benefits should be considered. *Benefit* can be defined further as the positive outcomes (effectiveness) of a clinical intervention, and *cost* can be interpreted as the cost of the intervention. If both costs and benefits increase, there is no definitive way to determine if quality improved. The resolution lies in an approach that considers the cost per unit of positive outcomes, or a cost-effectiveness study.

Kaiser Permanente conducted a 2-year demonstration program of ambulatory case management and found that although the case managed group had greater costs, they did not experience the functional status impairment or decline in health status perceptions reported by the control group.¹⁴ The study presented in this paper is a post hoc evaluation of the relationship between the costs associated with a case-management program and the average number of additional days of life, an outcome measure not used in earlier work.

... METHODS ...

Study Setting and Population

Three-hundred and seventeen enrollees in a managed care organization (MCO) who were ≥ 75 years of age and had severe functional disability, excessive hospital use, or emergency department (ED) use

were randomly assigned to a regular-care or case-managed group.¹⁴ *Severe functional disability* was defined as impairments in ≥ 2 activities of daily living (ADL), impairments in 3 instrumental activities of daily living (IADL), 1 ADL impairment plus 2 IADL impairments, confinement to home, or confinement to bed based on Ohio Senior Survey self-reports. *Excessive hospital use* was defined as 2 hospital admissions within the 6 months before the study period, and *excessive ED use* was defined as 2 ED visits in the month before the study period.

The study period lasted 2 years (1990 to 1992). During this time, the use and costs of medical services for 140 clients in the case-managed group and 177 clients in the regular-care group were accumulated. Thirty-four individuals in the case-managed group and 43 individuals in the regular-care group died.

Case-Management Model

The case-management model in this study is a patient advocacy model. The stated goal of the case-management intervention was to eliminate fragmented care, inappropriate utilization, unnecessary costs, and client confusion frequently associated with chronic care. We also expected that less costly outpatient visits would be substituted for hospital and ED care.

A geriatrician who served as the physician advisor for the main study developed the protocols for the case managers, and physicians at the MCO medical offices approved the care plans. All case managers were healthcare professionals with geriatric case-management experience, and during this study, they became integral members of a patient-care team comprising the case manager, the client's personal physician, and the physician advisor. The team developed the initial care plan for each client, and the case managers were responsible for making periodic home visits, reporting back to the care team, and helping to revise the care plan as necessary. While case managers made at least one home visit every 6 months, weekly visits to some clients were fairly common. Case managers also scheduled medical appointments, accompanied patients on these appointments, and assisted with nonmedical services such as respite care, Meals-on-Wheels, nursing home placement, Medicaid eligibility, and transport to and from the physician's office.

Definitions

Effectiveness. We evaluated effectiveness according to 2 variables: average death rate and number of

days of coverage. We controlled for the different number of clients in each group and compared these outcomes between groups. We calculated the number of deaths per thousand. Since we expected the death rates to be similar between groups due to the similar group characteristics, we calculated the average number of days of coverage, or *exposure*, to gain insight into the timing of the deaths. We theorized that improved health benefits may not necessarily prevent death but could prolong life. For each client in each group, there were 730 potential number of days of exposure, given that the study period was 2 years. For any client who died before the end of the study period, the number of days of exposure would be reduced by the number of days from the date of death to the end of the study period. For example, a client who died 70 days before the end of the study period would have 690 days of exposure.

Cost. In a typical cost/benefit or cost-effectiveness study, the intervention is medical and the costs of the medical services are direct costs. Indirect costs are typically associated with lost productivity.¹⁵ In this study, however, it is inappropriate to consider the costs of all medical services as direct costs. The costs of medical services resulting from the case-management process (ie, medical services above and beyond those used by the regular-care group) are more appropriately considered indirect costs, as these medical services would simply attenuate any accrued benefits. Alternately, the costs of the case-management program administration, or inputs, were considered to be direct. To avoid confusing terminology, we identified the cost of program inputs as program costs (PCs) and the cost of services as service costs (SCs).

A research assistant documented the activities of the case managers and clients in the case-management

Table 1. Comparison of Client Characteristics: Case Managed and Regular Care

Characteristic	Case Managed (%) (n=140)	Regular Care (%) (n=177)	Sig
			χ^2
Sex			
Female	65	62	
Male	35	38	.343
Educational level			
Grades 0-8	35	36	
Grades 9-11	34	31	
High school graduate	19	21	
Some college	9	10	
College graduate	1	2	
Post-college work	2	0	.244
Living status			
Living with others	59	34	
Living alone	41	66	<.001
Level of dependency			
Not limited in any way	25	27	
Have trouble getting around	18	16	
Use special aid to get around	44	41	
Need help of another person	9	9	
Confined to home	4	6	
Confined to bed	0	1	.545
E-path			
Survey	65	57	
Hospital use	6	0	
ED use	9	2	
Survey and hospital use	4	6	
Survey and ED use	11	17	
Hospital and ED use	1	0	
Survey, hospital, and ED use	4	18	<.001
Self-assessed health status			
Excellent	9	10	
Good	31	31	
Fair	42	46	
Poor	18	13	.673
			t test
Mean age (years)	81.17	82.40	.020
Mean ADL impairments	6.32	6.62	.281
Mean IADL impairments	5.65	5.60	.742
Mean QOHS	4.26	4.34	.743

ED=emergency department; ADLs=activities of daily living; IADL=instrumental activities of daily living; QOHS=quasi-objective health status (total number of conditions).

group. Program costs were the salaries and fringe benefits of the 2 case managers and the research assistant. Service cost data were taken from the 1992 Kaiser Permanente Medicare Financial Performance Report. Hospital costs were calculated using diagnosis-related groups (DRGs) for the appropriate fiscal year and the Kaiser Permanente Ohio reimbursement rate, and outpatient and ED visit costs were based on an average cost per visit calculated by service, medical specialty, and provider type.

Other Considerations

Other Influencing Variables. We considered a variety of other client characteristics that could influence death rates, days of exposure, and use of services—including demographic variables and health status.

Demographic variables included age, gender, and education. In a general population, age is usually positively correlated with use and cost of services. On the other hand, there is some evidence in the literature that the intensity of treatment tends to decrease with age in an elderly population.¹⁶⁻¹⁹ Excluding childbearing, females generally use less care than males. The higher the education level, the more likely the client is to specify “no heroic measures” upon impending death. Clients who live alone generally use more care, particularly hospital care, than clients who live with others.

Health status variables included ADL and IADL dependency, criteria for inclusion in the study (E-path), the level of dependency, self-assessed health

status, and quasi-objective health status (QOHS). The extent to which a client needed help in performing the 5 ADLs or the 4 IADLs is an indication of functional disability; use of care is likely to increase with the level of functional disability. Since a client could have been included in the study based on a survey response indicating functional disability, excessive hospital use, excessive ED use, or a combination of any 2 or all 3 of these criteria, we assessed the potential for the specific inclusion criteria to influence the outcome (E-path). Clients meeting a combination of these criteria would potentially use more care. The level of dependency was a measure of the extent of help the client needed to get around, or the degree of confinement (ie, to a house or bed). This variable also implies an increasing level of functional disability and is likely to result in greater use of care. The self-assessed health status was a subjective measure of health rated as excellent, good, fair, or poor. Those who rated their health as poor are likely to use more care than those who rated their health as excellent. The QOHS was a questionnaire in which clients indicated whether they had suffered any 1 of the following disease conditions: diabetes, high blood pressure, heart trouble, stroke, lung/breathing problems, chronic cough, cancer, circulation problems, arthritis or rheumatism, hip fracture, Parkinson’s disease, memory loss, hearing loss, or other (describe). Since most of these conditions suggest a prior diagnosis by a healthcare provider, we considered the QOHS to be a more objective measure of health status than the self-assessed health status. We did not attempt

to distinguish the severity of these conditions and used a simple count of the number of conditions. We considered these health status variables, in most cases, to be determinants of both utilization and death.

Cost-effectiveness Analysis. We determined the difference between the average total cost per person in the case-managed and regular-care groups by adding total group service costs and dividing by the number of clients in the group. We then calculated the cost

Table 2. Descriptive Statistics: Case-Managed and Regular-Care Clients

	Case-Managed Care (n=140)	Regular Care (n=177)
Service costs for study period (SC)	\$2,414,043	\$2,473,221
Program costs (PC)	\$135,314	N/A
Total costs for study period (SC+PC)	\$2,549,357	\$2,473,221
Average total cost per person	\$18,210	\$13,973*
No. of deaths	34	43
Mortality rate per 1000	242.8	242.9
Average number of days of exposure	656	550 [†]

*P=.05.

[†]P=.01.

per life saved and the cost per additional day of life by dividing the difference in the average total cost per person by the difference in death rates per person and the cost per additional day of life by dividing the difference in the average total cost by the difference in the average days of life per person.

... RESULTS ...

Table 1 compares the potentially confounding demographic and health status factors of the 2 groups. Three variables differed statistically between groups and included living status, E-path, and age. More clients in the regular-care group lived alone and qualified for the study based on all 3 criteria, suggesting greater use of medical services by this group. The average age of the regular-care group was also greater than that of the case-managed group, and this could have equivocal implications for service use.

Table 2 shows the overall results. The total costs of treatment (SC) for the 2-year study period were very similar for both groups (\$2.4 million per group). Since the total cost of the intervention (PC) was \$135,314, the overall average total cost per person was significantly higher for the case-managed group ($P=.05$). Overall death rates were very similar between groups, with rates of 242.8 and 242.9 per 1000 people in the case-managed and regular-care groups, respectively (Table 2). The average number of days of exposure was statistically higher for the case-managed group ($n=656$ and 550 for the case-managed and regular-care groups, respectively; $P=.01$).

The cost per life saved was \$42,370,000. The cost per additional day of life was \$39.97.

... DISCUSSION ...

The case-management model adopted in this program was clearly a patient advocacy model. The case managers, acting in the best interest of the clients, encouraged and facilitated use of the healthcare system. It is not surprising, then, that the average cost per person was greater for the case-managed group. While a simple evaluation of the between-group difference in the cost per person would suggest that the program was a failure, a very different picture emerges when the benefits are also considered. Consistent with the dynamic inherent in the Donabedian definition of quality,¹³ quality improved in this study. From this perspective, the program

may very well be considered a success. Although the extrapolated cost per life saved may appear alarming, the cost of an additional day of life was only approximately \$40. This may be a small price to pay.

These results point out the need to carefully evaluate the various models of case management, their underlying dynamics, and their desired outcomes. In other words, the underlying dynamics of a case-management model must be consistent with the reasons for its implementation. These results also point out the need to evaluate both the benefits and costs of case management, no matter what the impetus for its implementation, before determining that a program is a failure or a success.

Several caveats are in order. First, this study examined 1 case-management intervention in 1 setting with a very unique population. As such, the results cannot be generalized to any other population. Second, we considered an additional day of life to be a positive outcome. It is entirely possible, particularly with our population, that an additional day of life may not be desired. Given the available data and the methodology adopted for this study, an independent measure of the quality of life inherent in an additional day of life (on average) cannot be determined. Any attempt to measure the quality of an additional day of life using any validated instrument when death is eminent would require an unacceptable intrusion and would be nearly impossible. Given this, it seems reasonable to accept an additional day of life as a positive outcome of a case-management intervention.

Overall, our results using the outcome measure of an additional day of life are very encouraging and support the need for further study. Additional research involving other patient populations, study settings, and case-management models is warranted.

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