

A RANDOMIZED TRIAL OF COMPREHENSIVE GERIATRIC ASSESSMENT IN THE CARE OF HOSPITALIZED PATIENTS

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Abstract Background. Although many studies describe benefits from the comprehensive assessment of elderly patients by an interdisciplinary team (comprehensive geriatric assessment), the most supportive evidence for the process has come from programs that rely on specialized inpatient units and long hospital stays. We examined whether an inpatient geriatric consultation service might also be beneficial in a trial involving four medical centers of a group-practice health maintenance organization (HMO).

Methods. We conducted a randomized clinical trial with 2353 hospitalized patients 65 years of age or older in whom at least 1 of 13 screening criteria were present: stroke, immobility, impairment in any basic activity of daily living, malnutrition, incontinence, confusion or dementia, prolonged bed rest, recent falls, depression, social or family problems, an unplanned readmission to the hospital within three months of a previous hospital stay, a new fracture, and age of 80 years or older. Of the 1337 patients assigned to the experimental group, 1261 (94 per-

cent) received a comprehensive geriatric assessment in the form of a consultation, with limited follow-up; the 1016 patients assigned to the control group received usual care. The functional and health status of the patients was measured at base line and 3 and 12 months later; survival was assessed at 12 months. Subgroups of patients who might be presumed to benefit from comprehensive assessment were also studied.

Results. The survival rate at 12 months was 74 percent in the experimental group and 75 percent in the control group. At base line, 3 months, and 12 months the scores of the two groups on measures of functional and health status were similar. The analysis of 16 subgroups did not identify any with either clearly improved functional status or improved survival.

Conclusions. In this HMO, comprehensive geriatric assessment by a consultation team, with limited follow-up, did not improve the health or survival of hospitalized patients selected on the basis of screening criteria. (N Engl J Med 1995;332:1345-50.)

THE usefulness of comprehensive geriatric assessment as a method of improving the health care of frail elderly persons is still in question. Although a number of studies¹ have demonstrated benefits of the approach — improved health status, conservation of health care resources, improved survival, and greater likelihood of living at home — these benefits have not been consistently demonstrated across studies and settings. The most persuasive evidence to date has come from programs with inpatient units specifically designed for assessment and rehabilitation. In these units, the geriatrics team usually provided primary care for the patients they assessed, and those patients typically stayed longer in the hospital than the control patients.

In an era of concern about the costs of health care, recent research has focused on whether the benefits achieved by comprehensive assessment of elderly patients can be provided without lengthening hospital stays. One approach has been the use of inpatient geriatric consultation services. Theoretically, geriatric consultation teams can formulate treatment plans that continue to be carried out after hospital discharge, thus providing the benefits of comprehensive assessment without lengthening hospital stays. However, the evi-

dence from trials of assessment by an inpatient consultation service has been inconsistent.¹ The lack of success in some studies has in part been attributed to poor implementation of the assessment team's recommendations, either because primary care physicians fail to accept the recommendations² or because of a lack of adequate resources to carry them out.³

We conducted a randomized clinical trial to examine the benefits of comprehensive geriatric assessment by an inpatient consultation service on the health status and survival of hospitalized elderly patients at four medical centers of the Southern California Kaiser Permanente health maintenance organization (HMO). We believe that an HMO is a good setting in which to study this approach, for several reasons. First, HMOs that are prepaid by Medicare on a capitated basis are not constrained by Medicare reimbursement guidelines. They can provide all services their staff members believe will benefit their patients. Second, all physicians who provide care to patients in this type of HMO are members of the same group-practice partnership, which may increase their cooperation with the recommendations of a consultation team. Third, because HMOs are fiscally responsible for the ongoing care of patients, they may be more willing to invest in services that do not provide immediate benefit but that may improve the long-term health of their patients.

METHODS

The rationale and design of the trial have been described previously.⁴ The study was approved by the institutional review board of the Southern California Kaiser Permanente Medical Care Program and was conducted from March 1991 through March 1994. Patients who were 65 years of age or older were screened 24 to 72 hours after admission to one of the four experimental sites to determine whether

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they met any 1 of 13 criteria for inclusion in the study: stroke, immobility (difficulty walking), impairment in any basic activity of daily living, malnutrition, incontinence, confusion or dementia, prolonged bed rest (for most of each day in the previous two weeks), falls within the previous three months, depression, social or family problems, unplanned readmission to the hospital within three months of a previous hospitalization, a new fracture, and an age of 80 years or older. The techniques for applying these criteria have been reported previously.⁵ Patients were excluded from the study if they had been admitted to a hospice or for terminal care, were not members of the HMO's health plan, lived outside the HMO's medical-service area or were usually cared for at a medical center in the HMO that was not in the study, were discharged or died before randomization, did not speak English, or were admitted from a nursing home.

The randomization of patients was stratified according to site. Because each consultation team was capable of assessing up to two patients per day, no more than four patients per day were randomized at each site. If more than four patients were eligible at a site on a given day, a subsample of four patients was randomly selected from all the eligible patients. The four patients were randomly assigned with the use of a random-number table in blocks, so that two patients were assigned to the assessment group and two were assigned to the control group. On days when only one patient was available for assignment, that patient was assigned to the assessment group. If only three patients were available, two of the three were randomly assigned to the assessment group. As a result, the number of patients in the assessment group at each site (and in the study as a whole) was larger than the number in the control group.

A research assistant who was unaware of the patients' group assignments administered a questionnaire about their functional and health status that focused on the month before hospitalization. If a patient was unable to complete this base-line questionnaire, information about the patient's ability to perform basic activities of daily living was obtained from a proxy, usually a family member.

Patients in the assessment group were interviewed and examined by a team comprising a social worker, a nurse practitioner, and a geriatrician. Using a standardized, multidimensional assessment instrument, the nurse practitioner recorded each patient's medical history and performed a limited physical examination, focusing on geriatric issues; the social worker assessed functional status and cognitive and emotional health, noted stressful or otherwise important events in the patient's life, and reviewed the patient's social-support system, use of community services, and advance directives. After these evaluations, the nurse practitioner and social worker met with the geriatrician to present and discuss the case, and usually the entire team then saw the patient together. The geriatrician summarized the geriatric problems and the team's recommendations in a structured consultation note that was sent to both the attending physician and the patient's primary care physician. Team conferences were held daily and lasted about 1 hour, with 20 minutes spent on each new patient and 20 minutes on follow-up of previously assessed patients.

Because all the physicians at the HMO were part of the same multispecialty medical group, recommended procedures that did not involve major changes in therapy (e.g., physical therapy or laboratory testing) usually were directly ordered by the geriatrician. When a major change in therapy was recommended, the geriatrician usually discussed the recommendation with the attending physician. Many of the recommendations were to be implemented after discharge.

The consultation team continued to follow the assessed patients until discharge, to ensure that recommendations were implemented and to evaluate the patients' conditions. The social worker worked with the hospital's discharge planners regarding continuity of care and placed a follow-up telephone call to each patient three weeks after discharge. When appropriate, these discharged patients were discussed again by the team at its daily conference.

The questionnaire on functional and health status was readministered 3 months and 12 months after randomization. Again, information from proxies was used if patients were unable to complete the questionnaire. The charts of patients in the assessment group were reviewed to find out whether the team's recommendations had been carried out within three months after randomization. The charts were reviewed after six months to see whether recommended ap-

pointments with dermatologists, podiatrists, and audiologists had taken place. The survival rate at 12 months was determined for all patients.

The study's sample size was chosen in order to have an 80 percent power to detect a difference of 10 percentage points in mortality after one year (with hypothetical death rates of 20 percent and 30 percent) at the 0.05 level of significance. Meeting this goal required at least 313 patients in each group at each medical center.

Measures

The questionnaire on functional and health status consisted of three scales from the Functional Status Questionnaire⁶ concerning basic activities of daily living, intermediate activities of daily living, and social activities; the mental health index and current-health-perceptions scale from the Medical Outcomes Study⁷; and items from the Katz index of activities of daily living,⁸ modified so that standard response choices fit the format of the Functional Status Questionnaire. For patients who were unable to complete this instrument, proxy information from a relative, friend, care giver, or residential care administrator was obtained to arrive at a score on the items derived from the Katz index. All scores were standardized in a range of 0 to 100, with 100 indicating best function.^{6,7}

Mortality was determined by review of patient charts, the computerized membership files of the health plan, hospital records, information from hospitals and local and state agencies, and death certificates.

Statistical Analysis

When our data did not follow the normal distribution for continuous measures, transformations were explored, and whenever those also failed to follow a normal distribution, nonparametric methods such as the rank-sum test were used. All comparisons between the assessment and control groups were made on an intention-to-treat basis.

The functional status of patients in the assessment and control groups was compared at 3 and 12 months after study entry, on the basis of responses from the surviving patients who were able to complete the questionnaires or from proxies. Differences between the study groups in functional status according to time and the interaction between time and group assignment were examined by repeated-measures analysis of variance.

Survival was measured both as a one-year mortality rate and in terms of time lived during the study year; group comparisons were done with the chi-square and log-rank tests, respectively. Survival curves were constructed by Kaplan-Meier analysis (product-limit estimates).

We defined the subgroups expected to benefit from comprehensive assessment before conducting secondary analyses of potentially significant predictors and interactions; group assignment in the study was treated as a covariate. When we analyzed subgroups, interactions between group assignment and other covariates (e.g., age, baseline health status, and severity of illness⁹) were examined. Because of possible differences among the consultation teams at the four medical centers and other variations, both measured (e.g., in patient demographics) and unmeasured (e.g., in the practice styles of the geriatricians and primary care physicians), we included the medical center as a specific covariate. If there was evidence of quantitative interaction, tests for crossover interaction were performed with the method described by Gail and Simon.¹⁰ After we identified potential predictors of one-year survival, logistic regression was used to estimate the independent predictive value of each variable.

RESULTS

During the 54-week enrollment period, 11,689 patients were screened, and 2806 (24 percent) met one or more of the eligibility criteria. Of those eligible, 2353 (84 percent) were randomly assigned to the study groups, 1337 to the assessment group and 1016 to the control group. Of the 1337 patients assigned to the assessment group, 1261 (94 percent) actually were as-

sessed. Early discharge from the hospital was the most common reason for patients' not being assessed.

At base line, 78.4 percent of the patients were able to answer the questionnaire on functional status; proxy information on function was available for another 9.1 percent. Information about the functional status of 12.5 percent of the patients was unavailable because of delirium or dementia (in 35.8 percent), stroke or aphasia (14.5 percent), fatigue (13.5 percent), refusal to answer the questionnaire (11.5 percent), unavailability because other tests and procedures were being carried out (9.5 percent), and miscellaneous reasons, including an inability to locate a proxy respondent (15.2 percent). Three months after study entry, 72.9 percent of the original sample replied to the questionnaire; proxy information on functional status was received for 9.5 percent; 15.5 percent had died; and 2.1 percent of the patients were known to be alive but provided no information on functional status. At 12 months, 60.7 percent of the patients returned answered questionnaires; proxy information on functional status was received for 8.4 percent, 25.5 percent had died, and 5.4 percent were known to be alive but provided no information on functional status. The survival status of only three subjects was unknown at 12 months; 99.9 percent of the original sample was thus accounted for.

The base-line characteristics of the study groups are shown in Table 1. Since there were small but statistically significant differences between the assessment and the control groups as to age and sex, subsequent analyses were adjusted for these characteristics. Because of either death or an inability to complete the follow-up questionnaire, only 78 percent of the patients who reported on their own functional status at base line were able to do so 12 months later, at the end of the study.

Table 2 shows the patients' functional status at base line (just before admission to the hospital) and 3 and 12 months after base line. Scores on all measures declined at 3 months and improved by 12 months, usually returning to levels close to base line in the patients who survived. The patients in the assessment group had significantly higher scores than the control patients at 3 months on the mental health index and at 12 months on the current-health-perceptions scale. However, these differences were small and unlikely to be clinically meaningful. The patients with proxy responses to the questionnaire had a steady decline in function from base line to 12 months in all basic activities of daily living (data not shown), a reflection perhaps of the poor health of those who survived but were unable to complete the questionnaires on their own behalf. No differences in functional status were noted between groups among patients for whom proxy information was recorded.

Survival data are presented in Tables 2 and 3 and in Figure 1. The survival of assessed patients and control patients did not differ significantly either in the entire sample (Table 2) or in any subgroup (Table 3). In general, the functional and health status at 12 months did

Table 1. Base-Line Characteristics of the Study Patients.

CHARACTERISTIC	ASSESSMENT GROUP (N = 1337)	CONTROL GROUP (N = 1016)
Mean age (yr)	77.6	76.7
Female sex (%)	56	48
White race (%)	85	83
High-school graduate (%)	68	68
Living alone (%)	30	29

not differ according to treatment assignment in any of the subgroups (data are available elsewhere*). The subgroup of patients who met the entry criterion of immobility and underwent assessment had significantly better scores than the control patients on the scale of current health perceptions (51.7 vs. 43.9, $P=0.0067$), the mental health index (73.7 vs. 69.3, $P=0.0391$), and the social-activities scale (67.9 vs. 58.6, $P=0.0168$). However, assessment-group patients whose initial scores were at warning levels on the scale of basic activities of daily living had significantly lower scores than control patients on that same scale after 12 months (73.4 vs. 78.1, $P=0.0415$). Similarly, assessed patients with initial warning-level scores on the social-activities scale had significantly lower scores at 12 months on the scale of basic activities of daily living than did control patients (70.7 vs. 78.2, $P=0.0031$).

To explore why comprehensive assessment failed to provide health benefits, we examined the percentage of the teams' recommendations that were implemented. Implementation rates were highest for recommendations of placement in rehabilitation facilities and for referrals to nonphysicians for rehabilitation (both rates exceeded 70 percent). Implementation rates were moderate for recommendations of referral for home health care (64 percent), adjustments in medication (62 percent), diagnostic tests (54 percent), and interventions for specific conditions (45 percent). Recommendations of referral to other physicians — usually surgical specialists — or to professionals in fields other than rehabilitation (e.g., audiology, optometry, dietetics, and podiatry) had poor implementation rates (less than 33 percent).

DISCUSSION

In this large, multicenter, randomized clinical trial we attempted to determine whether comprehensive geriatric assessment by a multidisciplinary consultation team could provide benefits in functional and health status and increase one-year survival. We analyzed a wide variety of subgroups for possible effects on our primary outcomes. In selecting patients for comprehensive assessment, we relied on criteria that have success-

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Table 2. Functional Status at Base Line, 3 Months, and 12 Months and Survival at 12 Months, According to Study Group.*

MEASURE	BASE LINE		3 MONTHS		12 MONTHS	
	ASSESSMENT GROUP (N = 1083)	CONTROL GROUP (N = 761)	ASSESSMENT GROUP (N = 973)	CONTROL GROUP (N = 742)	ASSESSMENT GROUP (N = 808)	CONTROL GROUP (N = 619)
	<i>mean score (95 percent confidence interval)†</i>					
Basic activities of daily living	85.1 (83.8–86.4)	86.0 (84.4–87.5)	80.5 (78.9–82.1)	80.2 (78.4–82.0)	83.4 (81.9–85.0)	83.7 (81.9–85.4)
Intermediate activities of daily living	57.0 (54.9–59.1)	56.6 (54.1–59.1)	50.7 (48.5–53.0)	50.2 (47.6–52.8)	57.1 (54.7–59.5)	55.6 (52.9–58.3)
Social activities	74.8 (72.7–77.0)	73.3 (70.8–75.9)	63.6 (61.1–66.1)	63.0 (60.2–65.8)	70.0 (67.4–72.6)	67.3 (64.4–70.3)
Mental health index	75.1 (73.9–76.2)	73.8 (72.5–75.2)	71.6 (70.3–72.9)‡	69.5 (68.0–71.0)‡	72.3 (70.9–73.7)	70.6 (69.0–72.3)
Current health perceptions	47.4 (45.7–49.2)	47.3 (45.2–49.4)	47.0 (45.2–48.8)	45.1 (43.1–47.2)	50.1 (48.1–52.1)§	46.3 (44.0–48.6)§
	<i>percent (95 percent confidence interval)</i>					
Survival¶	—	—	—	—	74.0 (72.0–76.0)	75.0 (72.0–77.0)

*At 3 and 12 months, only surviving patients for whom data were available are included in the functional-status analysis. All analyses have been adjusted for age and sex. Statistical tests are based on the pooled variance of groups. Confidence intervals are based on individual group standard errors.

†All scores are on a scale of 0 to 100, with 100 representing best function.

‡P=0.04 for the comparison between study groups.

§P=0.01 for the comparison between study groups.

¶All analyses included all subjects originally assigned to the study groups (intention-to-treat basis).

fully predicted increased lengths of hospital stay, nursing home residence, and mortality.¹¹ Because previous studies have attributed negative results to poor implementation,^{2,3,12} we sought to raise implementation rates by providing the consultation team with the ability to order some treatment and testing directly, in addition to its authority to make written, and sometimes oral, recommendations to primary care givers. We then tested our approach in an HMO with open access to services and a presumably high level of cooperation among physicians.

Overall, we found no substantial differences between the assessment and control groups in functional status at 3 and 12 months or in 1-year survival. Even when we examined the data on subgroups that might be expected to benefit from assessment, no clear pattern of improvement could be found. These findings are consistent with the results of some studies of comprehensive-assessment teams in acute care institutions,^{3,13,14} but not of other studies.¹⁵⁻¹⁷ Our findings are in agreement with the results of a recent meta-analysis of comprehensive assessment¹ and are consistent with the findings of studies of inpatient consultation for patients with specific conditions (e.g., delirium¹⁸ and psychiatric disorders^{19,20}).

Given these findings and the demonstrated benefits of other types of comprehensive geriatric assessment in other settings,¹ what are the possible explanations? First, the criteria for entry into the study may not have accurately identified the persons most likely to benefit from comprehensive assessment by an inpatient consultation team. As Winograd has noted, "Criteria that predict adverse outcomes, such as morbidity, mortality, functional decline, and high health care utilization may not necessarily select those patients most likely to benefit from the intervention."²¹ Some of these patients may be on a relentless course of deterioration that is not amenable to the interventions recommended in comprehensive assessment.

Second, the control patients in our study may have already been receiving a high standard of care. The use

of home health care services, rehabilitation units in hospitals, and rehabilitation services in nursing homes has increased dramatically over the past decade.²² Many of these services duplicate elements of treatment recommended in the comprehensive geriatric assessment. The HMO plan we used already provides for coordinated care; physicians are made aware of geriatric care practices in continuing-education programs. Primary care physicians and attending physicians may also have learned principles of geriatric assessment, because the same doctors cared for patients in both study

Table 3. Effects of Comprehensive Geriatric Assessment on Survival at One Year in Subgroups Expected to Benefit from Assessment, Adjusted for Age and Sex.

CHARACTERISTIC	ASSESSMENT GROUP	CONTROL GROUP	ODDS RATIO (95% CI)*
	<i>no. of patients</i>		
Age ≥80 yr	580	410	0.94 (0.71–1.25)
New fracture	148	99	0.69 (0.33–1.42)
Unplanned readmission within 3 mo	341	278	1.00 (0.71–1.43)
Immobility	427	307	0.92 (0.66–1.29)
Impairment in basic activities			
Bathing	300	210	0.95 (0.65–1.39)
Dressing	252	189	1.07 (0.71–1.62)
Using the toilet	200	151	1.05 (0.67–1.65)
Eating	110	74	0.67 (0.36–1.25)
Confusion or dementia	228	176	0.90 (0.60–1.35)
Prolonged bed rest	214	148	0.90 (0.57–1.42)
Warning-level scores on Functional Status Questionnaire†			
Activities of daily living			
Basic	487	327	0.94 (0.68–1.29)
Intermediate	630	460	0.83 (0.63–1.11)
Social activities	391	293	0.75 (0.53–1.06)
Mental health index	285	221	1.18 (0.78–1.79)
Age ≥80 yr and unplanned readmission within 3 mo	80	57	0.62 (0.29–1.30)
Immobility and falls within 3 mo	160	103	0.76 (0.43–1.33)

*Odds ratios are expressed as the likelihood of survival at one year among assessed patients as compared with control patients. CI denotes confidence interval.

†Scores ranged from 0 to 100, with 100 representing best function. Warning-level scores are 89 or below for basic activities of daily living, 72 or below for intermediate activities of daily living, 78 or below for social activities, and 65 or below for the mental health index. These four analyses included only patients who completed a base-line study questionnaire.

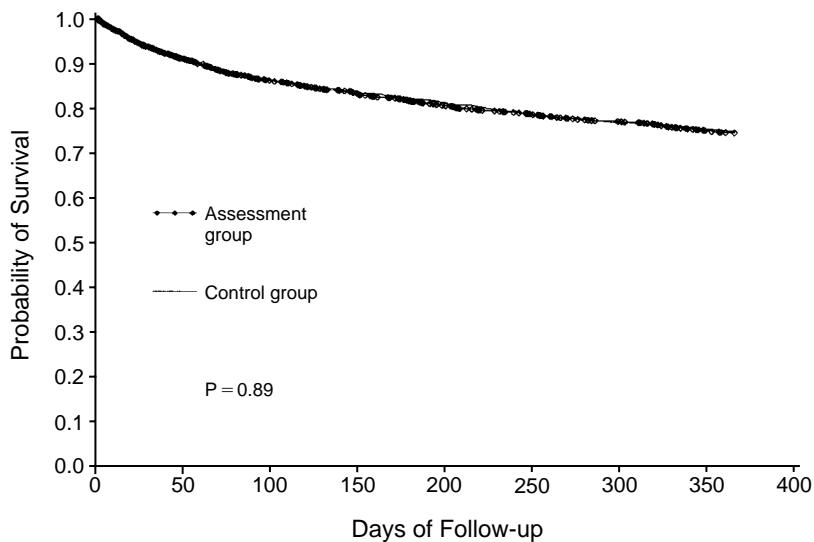


Figure 1. Probability of Survival According to Study Group.

groups. Any improved care of control patients could thus have contaminated the study's data.

The one-year mortality rate for control patients in our study was 25.4 percent, a rate within the range of 20 to 44 percent for the one-year mortality of control patients in previous studies of inpatient geriatric consultation teams.^{3,15,16,23} However, it is difficult to compare the mortality rates from various studies because of differences in selection criteria. The criteria in our study were quite similar to those used by Winograd et al.³ in a study of a Veterans Affairs hospital, in which 36 percent of the control patients died within 12 months of study entry. But the different settings may account for some of the discrepancy in one-year mortality among control patients.

A third possible explanation for the limited effectiveness of assessment is that the teams' recommendations were not well implemented. In general, implementation rates in this study were comparable to, or better than, those in other studies of comprehensive geriatric assessment.^{2,3,12} Nevertheless, they do not approach the implementation rates that could be achieved if the teams themselves assumed responsibility for the primary care of the patients and for all decisions about treatment.

Several limitations of our study should be noted. Although our sample was large, we did not meet our recruitment goal at every site. However, pooling the data from all sites gave the study enough power to detect clinically important differences in the primary outcomes. In our subgroup analyses, there was less power. Given the similarity of outcomes in the assessment and control groups, however, it is unlikely that statistical significance would have been achieved with larger samples. Comprehensive geriatric assessment, though, may have provided some benefits (for example, improved patient satisfaction) that we did not measure.

Our methods of recruiting patients may also have influenced our findings. Eligibility for assessment was based on selection criteria rather than on requests from

either physicians or patients, a study-design decision that we made to eliminate referral bias. Some physicians and patients — who had not sought out assessment — may not have been convinced of the value of the process and may not have diligently carried out the team's recommendations. Previous research has indicated that elderly patients who do not perceive themselves to be at risk for poor outcomes or who do not believe they will benefit from comprehensive assessment are more likely to decline to participate in the process.²⁴ Perhaps patients who requested the consultation in our study or were referred for it would have received greater benefit.

Finally, the HMO setting of our study may limit the generalizability of its results. The enrollment of elderly persons in HMOs is increasing,²⁵ however, and many of the patterns of care used by HMOs are being adopted elsewhere.

On the basis of our findings, we are reluctant to recommend widespread adoption of the inpatient consultation approach to comprehensive geriatric assessment. A recent study suggests that hospitalized, frail, elderly patients may benefit from comprehensive geriatric assessment and management that provides continuous rather than consultative care.²⁶ As programs that use comprehensive geriatric assessment assume increasing control of patient care, including longitudinal follow-up, they begin to resemble more typical patterns of primary care and concurrent care (i.e., continuous care provided by two or more physicians). This degree of control over patient care may be necessary to ensure effectiveness. Alternatively, steps designed to improve physicians' implementation of assessment teams' recommendations and patients' adherence to these recommendations may increase the effectiveness of comprehensive geriatric assessment.²⁷

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