

Adult Day Health Care Evaluation Study: Methodology and Implementation

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The Adult Day Health Care Evaluation Study was developed in response to a congressional mandate to study the medical efficacy and cost effectiveness of the Adult Day Health Care (ADHC) effort in the Department of Veterans Affairs (VA). Four sites providing ADHC in VA facilities are participating in an ongoing randomized controlled trial. Three years of developmental work prior to the study addressed methodological issues that were problematic in previous studies. This developmental work resulted in the methodological approaches described here: (1) a patient recruitment process that actively recruits and screens all potential candidates using empirically developed admission criteria based on predictors of nursing home placement in VA; (2) the selection and development of measures of medical efficacy that assess a wide range of patient and caregiver outcomes with sufficient sensitivity to detect small but clinically important changes; and (3) methods for detailed, accurate, and efficient measurement of utilization and costs of health care within and outside VA. These approaches may be helpful to other researchers and may advance the methodological sophistication of long-term care program evaluation.

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Designing and implementing any evaluation study presents investigators with a series of methodological problems amenable to alternative approaches. Each approach is apt to have its own advantages and disadvantages, but ultimately one option must be selected. We present here the methodological issues raised and approaches taken in the design and implementation of an ongoing multisite trial of the medical efficacy and cost effectiveness of Adult Day Health Care (ADHC). We hope this presentation will assist others dealing with similar issues, as well as those who will be particularly interested in the eventual findings of this evaluation. We begin with a discussion of the background and policy context of this study.

Adult day care is assuming increasing prominence as an element in the continuum of long-term care services, with the number of these programs increasing from 300 in 1978 to more than 2,000 in 1989 (Von Behren 1989). Several nonrandomized evaluations of patient outcomes associated with such services have been conducted (Capitman and Gregory 1984; Chappell and Blandford 1987; Community Research Applications, Inc. 1975; Kalish et al. 1975; Oster and Kibat 1975; Rathbone-McCuan and Elliot 1976/1977; Sherwood, Morris, and Ruchlin 1986; Von Behren 1979; Weiler, Kim, and Pickard 1976). In the aggregate, the findings of these studies have provided some evidence of beneficial outcomes, including increased patient functioning and reduced cost of care. In these studies, however, major differences in baseline subject characteristics often have been found between the adult day care and comparison groups. These differences threaten the internal validity of the studies and limit their generalizability to other

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Table 1: Description of VA Adult Day Health Care Programs

Target population	Frail elderly at risk for nursing home placement
Staffing	Part-time physician, registered nurses and nursing assistants, rehabilitation therapists, a social worker, and a part-time nutritionist (8.5 full-time employee equivalents)
Average daily census	Target: 35 patients per day
Services offered	Medical services such as monitoring of complex medication and other treatment regimens; occupational, physical, and recreational therapy; personal care such as bathing, toileting, and catheter care; social services
Patient schedules	Four to eight hours per day from one to five days per week
Treatment goals	Stabilization of health status, rehabilitation to improve or maintain a functional level that allows the patient to remain at home, remotivation to participate actively in self-care, and support and respite for the caregiver

settings and patient populations. Three studies using more rigorous, randomized designs have been reported (Weissert, Wan, and Livieratos 1979; Tucker, Davison and Ogle 1984; Cummings et al. 1980). The results of these studies have been mixed, providing modest evidence for positive effects on patient function and strong evidence for *increased* overall costs of care when patients receive day care services. In their review of the literature, Kane and Kane describe day care as an “attractive” program conceptually, but one “relatively untested” that needs to be “carefully focused and well targeted.” They note that “presently available evidence makes day care a much less certain investment than home care” (Kane and Kane 1987, 162).

In November 1983, Congress passed PL 98-160, authorizing the Veterans Administration (now Department of Veterans Affairs—VA), to provide Adult Day Health Care to eligible patients. ADHC is defined in VA as “a therapeutically oriented ambulatory day program which provides health maintenance and rehabilitative services to frail elderly individuals in a congregate setting during daytime hours” (Office of Geriatrics and Extended Care 1987, 1). The programs, described in Table 1, are designed to keep frail elderly veterans in need of professional care and supervision in their homes and communities by providing the intensive professional component of institutionalized care in a congregate daytime setting.

Interest in information about this promising but expensive and relatively untested initiative that could eventually spread to all 172 VA medical centers led Congress to mandate in the same legislation “a

study of the medical efficacy and cost effectiveness of furnishing such care" (PL 98-160). The ADHC Evaluation Study described here is the result of our efforts to operationalize the congressional mandate according to state-of-the-art research design, patient targeting, and outcome measurement. The study results, due to Congress in 1991, should also be of use to Congress in its deliberations regarding the inclusion of ADHC under Medicare (U.S. Congress, Senate 1989, S.524). The study has been designed to provide extensive measurement of program characteristics, separate analysis of results by site and for subgroups of patients, and modeling of the relative costs of ADHC care in different situations, all in an explicit effort to provide results of maximum usefulness to Congress, administrators, and clinicians.

The study overview is presented in Table 2. This randomized controlled trial is designed to evaluate ADHC as provided directly by VA in its own facilities. A companion study is designed to evaluate ADHC provided by community facilities under VA contract. Differences between the two types of programs, including the time at which they were implemented and the number of patients to be served,

Table 2: Study Overview

Research questions	<ul style="list-style-type: none"> a. What is the effect of ADHC on patient survival, functional status, and satisfaction with care? b. What is the effect of ADHC on caregiver burden and on caregiver satisfaction with the patient's care? c. What is the effect of ADHC on patient utilization of health services? d. What is the effect of ADHC on costs of patient care?
Design	Randomized trial with patients randomly assigned to receive ADHC services or customary care within each site
Number of subjects	826 Enrolled, July 1987-January 1989
Sites	Little Rock, AR; Miami, FL; Minneapolis, MN; Portland, OR
Variables	
Patient	Multiple demographic characteristics, survival, functional status, satisfaction with care, health service utilization and costs
Caregiver	Demographic characteristics, functional status, caregiver burden, satisfaction with patient care
Program	Physical facilities, services and activities, hours of operation, staffing
Data collection	In-person patient and caregiver interviews at study entry, 6 and 12 months; computerized patient data base; VA records; and provider questionnaires

required a different study design for the companion study. To enhance clarity of presentation, only the VA-based randomized trial is described here.

In designing this study, we made effective use of a three-year period between the passage of the legislation and full funding of the programs to conduct pilot work on methodological issues. We directly addressed the design and other methodological issues discussed in earlier critiques of research in this area (Kane and Kane 1987; General Accounting Office 1982; Weissert 1985; Hedrick and Inui 1985; Hughes 1985). These issues include: (1) the need for adequate sample sizes and enrollment of patients at higher risk of nursing home placement, so that we can adequately evaluate the potential of ADHC to substitute for nursing home care; (2) the use of broader and more sensitive measures of patient health status and caregiver outcomes; and (3) the need for increased detail and accuracy in the measurement of utilization and cost of services. Our approach to each of these issues, posed as questions, will be discussed in turn.

1. WHAT PATIENT RECRUITMENT STRATEGIES COULD BE USED TO INCREASE ENROLLMENT AND THE PROPORTION OF ENROLLED PATIENTS IN THE TARGET POPULATION?

A major challenge in this study was to enroll enough patients at high risk of nursing home placement who could be served in an outpatient program such as ADHC, to fill both the ADHC and customary care arms of the trial. We will first summarize the factors that make recruitment especially difficult, categorized into three groups: (1) the clinical program one is recruiting for; (2) discharge planning, for programs targeting hospitalized patients in need of specialized care after discharge; and (3) the specific targeted population. We then discuss the lessons learned regarding the need for extensively trained and supervised research casefinders and the development of patient admission criteria based on empirically identified characteristics of the target population.

FACTORS AFFECTING RECRUITMENT

The Clinical Program

The easiest programs to recruit for are those that are familiar to and popular with staff, patients, and families. Adult day health care, especially the intensive, professionally staffed model evaluated here, is relatively new in this country and totally new to the medical centers in which the study is taking place. Adult day care programs in this country have historically had problems in recruiting and maintaining sufficient numbers of patients to reach their target caseloads. "The inconveniences of transportation, the difficulty in getting mobilized, and perhaps even a preference for privacy and the companionship of one's own choice" are the factors cited by Kane and Kane (1987, 162) as primarily responsible for patient resistance to the program.

Factors Affecting Discharge Planning

The pressure to discharge patients early engendered by the diagnosis-related group (DRG) system, combined with staffing cutbacks and nursing shortages, have frequently created a situation where staff does not have time to consider appropriate discharge placement but instead merely arranges the usual dispositions: home with no special services, or nursing home. Referral to a program such as ADHC takes additional time and effort, principally because the patient may require a package of various community resources. In addition, patients who are referred might not enter the program because they are ineligible, inappropriate, uninterested, or assigned to the control group, and the referring clinician will then have to find an alternative disposition.

Patient Population

The congressionally intended target population for this study is patients at high risk of nursing home placement. Prior evaluations of community-based long-term care programs have been criticized for largely failing to enroll this particular population and thus of being unable to assess the potential ability of these programs to substitute for nursing home care (Kane and Kane 1987; General Accounting Office 1982; Weissert 1985). Patients targeted here are those who have generally been found to be most reluctant to participate in other programs or studies. They are elderly (Kaye, Lawton, and Kaye 1990; Mettlin, Cummings, and Walsh 1985; Naguib, Geiser, and Comstock 1968; Zimmer, Calkins, Ostfield, et al. 1985) and, by virtue of their being in the VA system, primarily males (Barofsky and Sugarbaker 1979; Papsi-

dero et al. 1979) of lower socioeconomic status (Buchner and Pearson 1989; Mettlin, Cummings, and Walsh 1985; Naguib, Geiser, and Comstock 1968; Papsidero et al. 1979; Settergren et al. 1983; Wilhelmsen et al. 1976). Hunninghake, Darby, and Probstfield (1987), in their review of recruitment in clinical trials, state that relying on clinical sources alone has generally been unsuccessful and that media campaigns to increase general public awareness have been important factors in successful recruitment. Public outreach, however, was not an option for this study because of the low number of people in the community legally eligible for VA services. We were thus compelled to increase the effectiveness of recruitment through clinical sources.

RECRUITMENT PROCEDURES

Our first step was to commit considerable study resources to recruitment: 26 percent of the research personnel budget in the fiscal year in which most of patient recruitment took place. We hired one full-time and one half-time senior level registered nurse "casefinder" at each site and a full-time "casefinder coordinator" at the central coordinating site. Not all casefinders were successful in the role. Important criteria for success were: experience in multiple roles; experience in the medical center in which the program was placed; ability to function independently; ability to adopt a more objective research role in addition to the caretaker role of a clinician; and most important, an engaging personality. We found that overworked medical center staff members will often decide whether to make referrals based at least as much on their desire to help the casefinder as on their desire for the patients to receive the program.

One major lesson was that the commitment of resources to recruitment should continue at an uninterrupted level until the end of the recruitment period. Turnover of medical center staff and the press of daily activities seemed to create an "out-of-sight, out-of-mind" situation. Also, staff, patients, and patient families all required intensive, continual education and assurance about this complex new care option and its potential to meet the needs of the very frail patient.

The steps in the recruitment process are presented in Figure 1. During the three years of pilot testing we evaluated multiple versions of this procedure, the admission criteria, and the screening instruments. This pilot testing was invaluable in fine-tuning the procedures to the realities of the medical centers and in determining the support needed by the casefinders to create and carry out their new roles.

A final lesson learned was that the amount of social support and

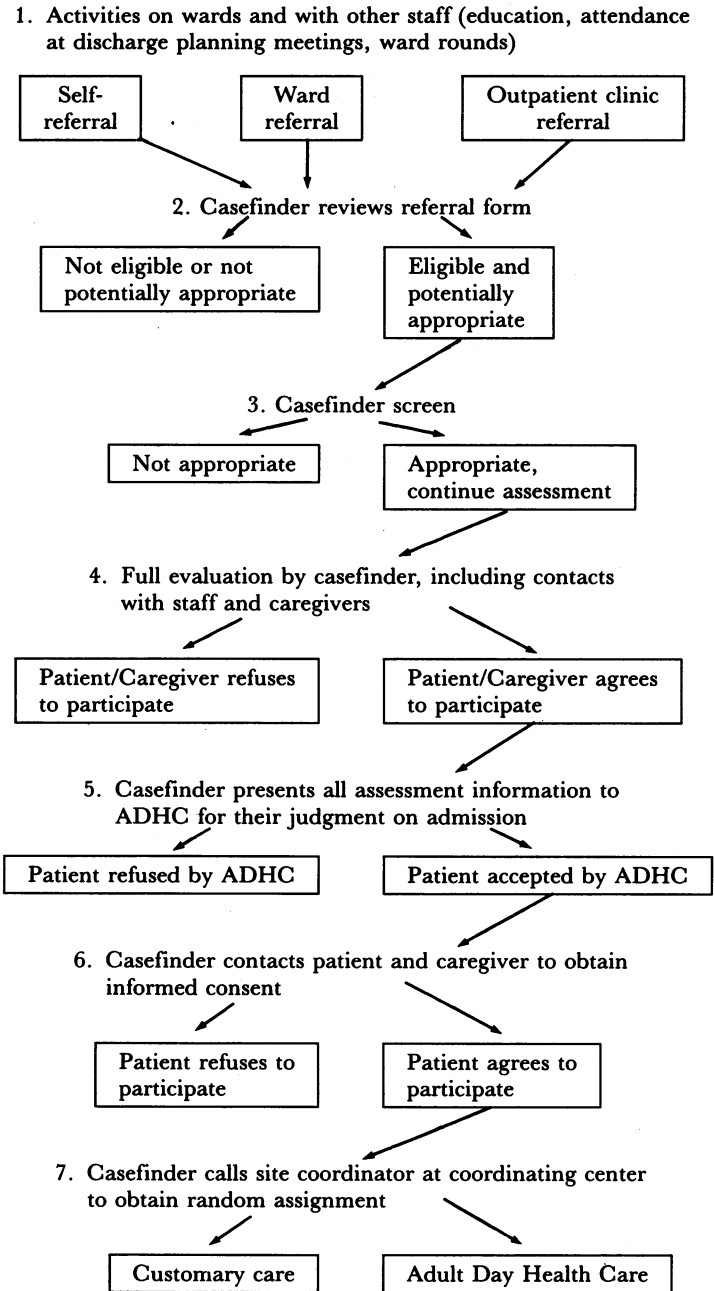
training needed by someone in this difficult role is extensive. The casefinder coordinator, a registered nurse with considerable experience as supervisor of a VA home care program, conducted biweekly conference calls with all casefinders and many other ad hoc phone contacts as needed. Casefinders also received extensive training in three sessions held at different times during the study.

DEVELOPMENT OF ADMISSION CRITERIA

The congressionally intended target population for this study is patients at high risk of nursing home placement. The ideal admission criteria would be based on information on the admission characteristics of VA nursing home patients. Such information was not uniformly available. We therefore conducted a prospective study of patients at two of the study sites to determine the characteristics that, when assessed within three days of hospital admission, predicted nursing home placement at discharge. The first admission criteria chosen were those characteristics that best predicted nursing home placement using multiple regression techniques. These criteria were (1) being admitted to a hospital from a nursing home, (2) requiring personal assistance or supervision to ambulate, and (3) significant short-term memory loss. A patient with one or more of these criteria could be predicted to be discharged to a nursing home (sensitivity = .96 and specificity = .72).

Pilot testing of these criteria revealed that the use of only these criteria would result in insufficient ADHC admissions to fill the programs and a case mix that was unacceptable to the programs. Additional analyses were then conducted to increase the number of patients and the sensitivity of the criteria while minimizing the increase in the false-positive rate. A few candidate criteria were eliminated after pilot testing when the casefinders determined that they could not be validly applied in the hospital settings. For example, circumstances often did not permit bathing patients in the first few days of a hospital stay, so there was no opportunity to determine the patient's level of independence in that function. The final criteria state that to be admitted to ADHC and the evaluation, the patient must have met at least one of the following conditions: was admitted to the hospital from a nursing home or is currently in a nursing home; requires personal assistance or supervision for ambulation, dressing, or toileting; shows significant cognitive impairment, as indicated by either of two items from the Mini-Mental State Exam (Folstein, Folstein, and McHugh 1975): disorientation to place or inability to recall three objects after a short period of time; or has bowel incontinence.

Figure 1: VA Adult Day Health Care Patient Selection Procedures



The success of these procedures in enrolling the target population will not be known until the percentage of customary care group patients who have nursing home stays during the 12-month follow-up period is known at the end of the study. The success of the procedures in enrolling a large number of patients is demonstrated by the 826 patients enrolled. Power calculations show an ability to detect a clinically significant difference of five points on the Sickness Impact Profile (SIP) (Bergner et al. 1981), our major measure of patient health status, given our current estimates of the standard deviation (18 points) and total attrition due to death or withdrawal (30.6 percent), with power of .90 ($\alpha = .05$, two-tailed test).

2. HOW SHOULD MEDICAL EFFICACY BE MEASURED?

A number of issues constrain the choice of instruments used to measure health-related outcomes in long-term care in general, and ADHC in particular. We developed the following set of criteria to guide us in selecting the instruments we would use.

- Program specification issue:
 - a. Instruments are needed to measure each domain of functioning.
- Characteristics of target population issues:
 - b. Instruments must focus on functional status rather than disease-specific conditions.
 - c. Instruments must be sensitive to changes in moderate to severe dysfunction.
 - d. Instruments must be capable of interviewer administration.
 - e. Instruments must not place undue burden on the respondent.
 - f. Instruments must have high levels of reliability and validity when used with the target population.

SPECIFICATION OF PROGRAM EFFECTS

The documentation of outcomes expected from ADHC by the existing providers of this modality of care was inadequate. It was therefore necessary for the research staff to determine expected outcomes

through discussions with clinicians, program managers, researchers, and representatives of national health care organizations. These discussions indicated that expected program effects are quite diverse. The primary goal is maintenance or improvement in any of several domains of function, including physical, psychological, and social functioning, combined with satisfaction with care. A secondary goal is to provide respite to informal caregivers. This diversity of expected outcomes necessitated a broad approach to measurement.

CHARACTERISTICS OF THE TARGET POPULATION

One characteristic of the target population that needs to be considered in selecting measurement instruments is its heterogeneity. The target population for ADHC includes persons with a wide range of disease conditions. We chose to address this problem by measuring functional status rather than indicators of specific disease conditions, for several reasons. First, function serves as a common framework for persons with a wide range of symptoms. Second, the division of respondents into unique disease classifications would seriously impair statistical power. Third, most patients were expected to have multiple chronic conditions, and the best way to represent the overall significance of such conditions is by their impact on functioning rather than by changes in disease-specific indicators. Finally, some interventions may result in improvements in either functional status or physiologic indicators, but not both. In general, functional ability rather than physiologic change is the outcome of interest to patients and society (Rubenstein et al. 1989).

Another characteristic of the target population that needs to be considered is its level of frailty. The congressionally intended target population for this study is very impaired. The measurement implications of such frailty relate to criteria c through f. First, an instrument must focus on the moderate-to-severe end of the health status continuum. It must also be sensitive enough to capture relatively small changes in health status, because the age and the frailty of the target population mean that, for most patients, only such changes can be expected. Second, many respondents will not be able to self-administer a questionnaire due to physical or cognitive impairment, so an instrument must be amenable to interviewer administration. And third, instruments must not place an undue burden on the frail respondent relative to either the length of time required to complete the interview or the cognitive complexity of the response task. The last criterion is

related to the psychometric properties of the instruments. It is generally a part of all instrument selection, but is especially important when effect sizes are expected to be small.

We were not able to find instruments to meet all criteria for any domain of functioning. We adapted instruments to meet study requirements, and in one case (satisfaction with care) developed an instrument because we found none that was close enough to be adapted. We selected the Sickness Impact Profile (SIP) (Bergner et al. 1981) to measure overall functioning because it was shown to be capable of detecting small changes, focused on measurement of more impaired functioning, and had been subjected to extensive psychometric analyses.

The SIP had been used with the frail elderly in two reported studies; however, the psychometric properties and respondent burden had not been reported. To ensure adequate performance with the target population, we conducted a pilot study with non-cognitively impaired nursing home residents (Rothman, Hedrick, and Inui 1989). We examined the internal consistency, acceptability to respondents, and relationship of the SIP to other instruments to measure physical and psychological function. Category scores were compared to scores obtained in other studies as a validity check. Findings showed that, in nine out of ten categories, internal consistency of category scores from the nursing home sample were higher than those reported for the original developmental studies (original studies ranged from .29 to .71 and the nursing home coefficients ranged from .60 to .84), and that patterns of scores followed the expected direction with respect to level of severity. Respondent burden, assessed by length of time needed to administer the instrument and respondent comments on perceived difficulty, was found to be acceptable. Interviewer assessment of participants' response to the SIP also showed that, in general, respondents understood the instructions and did not consider the items unduly sensitive; and longer administration times were not associated with decreased reliability of responses.

We also found in our pilot studies that the SIP did not adequately represent the psychosocial domain and required minor changes in format and instruction to enhance patient understanding of the response task. These data also suggested that two instruments frequently used to measure the psychosocial domain in long-term care studies, the Life Satisfaction Index Z (Wood, Wylie, and Sheafor 1969) and Philadelphia Geriatric Center Morale Scale (Lawton 1972), were not easily interpretable. The primary reason for this lack of interpretability was the breadth of the concept that they were intended to measure, that is,

satisfaction with life. We reasoned that scales to measure more specific aspects of psychological functioning would be more useful to clinicians and researchers in a field where relatively little is known about client outcomes. For this reason, we selected an instrument that had been shown to have clearly defined and interpretable subscales but had not been used with the frail elderly—the Psychological Distress Scale, a subscale of the Mental Health Inventory (Veit and Ware 1983). Pilot testing of this scale showed that it had excellent psychometric properties when used with the target population, but that it required modifications in format to be more amenable to interviewer administration.

We were unable to find any measure of patient satisfaction with ADHC care, or any like measure that could be adapted to the needs of the study. The primary requirement for the ADHC study was a scale that would be general enough to measure satisfaction in each of several types of care environments, but specific enough to provide useful feedback to ADHC clinicians and program managers. The target population was expected to receive care in one or more types of environment, including ADHC, nursing home, or hospital. Thus, the instrument selected had to be capable of assessing satisfaction with care in any of these environments. We examined several scales designed to measure outpatient care (Ware, Davies-Avery, and Stewart 1978), home care (McCusker 1984), and nursing home care (McCaffree and Harkins 1976), but found that these scales were too specific to each setting to be adapted to several settings. We developed two scales to meet these goals: a specific scale to address relevant issues related to care in ADHC programs, nursing homes, and home care, referred to as the ADHC Patient Satisfaction Questionnaire (PSQ), and a general scale to assess overall attitudes related to care in the various environments called the Long-Term Care Patient Satisfaction Questionnaire. Scale items were developed based on other instruments and interviews with ADHC patients, clinicians, and researchers. Pilot testing with nursing home residents and community ADHC clients showed that both scales had internal consistency coefficients above .75 and that they discriminated between the two groups, with ADHC clients exhibiting greater satisfaction with care than nursing home residents (Rothman, Branch, Carter, et al. 1985).

To avoid problems associated with the use of multiple tests of significance based on the many outcomes included in the assessment battery, we chose to select one measure, the total SIP score, to use as our primary outcome measure to test the medical efficacy of ADHC. The final list of measures, including the source of data, is shown in Table 3.

Table 3: Medical Efficacy Variables and Indicators

<i>Variable</i>	<i>Indicator</i>	<i>Source</i>
Patient		
Health status		
Physical functioning	<ul style="list-style-type: none"> • Sickness Impact Profile (SIP), vision, hearing • Survival 	PT/CG*
Psychosocial functioning	<ul style="list-style-type: none"> • SIP • Mini-Mental State Exam† • Psychological Distress Scale • Adult Day Health Care (ADHC) Social Support Scale 	VA records/CG PT/CG PT PT
Self-perceived health	<ul style="list-style-type: none"> • Behavior problems 	CG PT
Satisfaction with care	<ul style="list-style-type: none"> • ADHC Patient Satisfaction Questionnaire (ADHC PSQ) • Long-Term Care Patient Satisfaction Questionnaire (LTC PSQ) 	PT PT
Caregiver		
Health status		
Psychosocial functioning	<ul style="list-style-type: none"> • Psychological Distress Scale • Life Satisfaction • ADHC Social Support Scale 	CG CG CG
Self-perceived health		CG
Burden of caregiving	<ul style="list-style-type: none"> • Caregiver Impact Scale‡ • Perceived seriousness of behavior problems 	CG CG
Satisfaction with patient care	<ul style="list-style-type: none"> • Caregiver version of ADHC PSQ • Caregiver version of LTC PSQ 	CG CG

*PT = patient; CG = caregiver.

†Folstein, Folstein, and McHugh 1975.

‡Montgomery and Borgatta 1989.

3. FROM WHOSE PERSPECTIVE SHOULD THE UTILIZATION AND COST STUDY BE CONDUCTED?

The overall objective of the cost assessment is to determine the relative cost of providing health care for patients in ADHC compared to patients receiving customary care. However, this leaves several questions that need to be resolved.

The costs to be measured and the usefulness of findings depend upon which perspective is taken in the study. Although the costs incurred by VA are primary, it was decided to analyze the incurring of costs from three perspectives: health care costs to VA only; total health care costs to all health care payers (e.g., the patient, Medicaid, Medicare, and other third party payers); and total health care costs plus the costs to the patient's family of the patient living at home. These three perspectives should make the findings of this study useful to many interested groups (e.g., Congress, other providers of adult day health care, Medicare, Medicaid, and other third party payers) as well as VA.

ADHC is designed to serve as a partial substitute for many services offered both within and outside VA, for example, nursing home care, ambulatory care, and hospital care. ADHC may also shift some of the burden of care from VA to other providers or to the patient's family. Therefore, to assess fully the impact of ADHC, this study assesses services for which ADHC will be a substitute and services that ADHC may shift to others. Measuring cost shifted to families and others will make ADHC appear expensive if costs were presented only as totals and were then compared to costs of other programs that did not include these types of costs. This issue is best dealt with by "unbundling" the costs in reports to permit different parties (e.g., VA, other providers or insurers, families) to evaluate the costs for which they are responsible.

Five sources of utilization and associated costs are included in the analysis: (1) health care within VA (e.g., ADHC, hospital care, ambulatory care); (2) health care outside VA that is paid for by VA (e.g., contract nursing homes); (3) other VA costs (e.g., Aid and Attendance Supplement); (4) health care outside VA that is not paid for by VA (e.g., private physician); and (5) home living costs (e.g., food, transportation). The sources of cost, as well as the methods used to measure utilization and cost within each source, are summarized in Table 4. An overview of the methods used to determine utilization and cost is presented below.

4. HOW CAN UTILIZATION AND COST OF SERVICES BE MEASURED ACCURATELY?

Veterans Affairs, like other non-fee-for-service systems such as health maintenance organizations, does not charge most patients for individual services. For this reason, VA has not developed a system for easily determining services received or their costs. However, several methods

Table 4: Summary of Methods for Determining Utilization and Cost of Care

<i>Health Care</i>	<i>Measure of Utilization</i>	<i>Measure of Cost</i>	<i>Source of Utilization Information</i>	<i>Source of Cost Information</i>
Health Care within VA				
1. Adult Day Health Care (ADHC)	Daily attendance	ADHC cost model	VA document	ADHC cost survey
2. Nursing home	Length of stay (LOS), Resource Utilization Group (RUG) LOS, DRG	RUG payment	VA document	VA Central Office
3. Hospital		DRG—payment, LOS	Decentralized Hospital Computer Program (DHCP)	VA Central Office
4. Ambulatory care	Clinic visit	Mean cost per visit	DHCP	VA document
5. Laboratory tests	Test	Cost per test	DHCP	VA document
6. Outpatient pharmacy	Medication prescribed	Cost of medication	DHCP	VA document
7. Hospital	Number of admissions	Cost per admission	VA document	VA document
8. Prosthetics	Prosthetics device	Cost of prosthetic device	Questionnaire	Questionnaire
9. Transportation	Trip	ADHC cost model	VA document	ADHC cost survey
10. Special equipment/supplies	Equipment or supplies	Cost	Questionnaire	VA document
11. Community health care	Number of placements	Cost of time to place patients	Community health care records	VA document

Health Care outside VA – Paid by VA

1. Adult Day Health Care	Daily attendance	Cost of contract	VA document	Contract
2. Nursing home	Daily attendance	Cost of contract	VA document	Contract
3. Hospital	LOS	Cost to VA	Questionnaire	Questionnaire
4. Ambulatory care	Number of visits	Cost to VA	Questionnaire	Questionnaire
5. Laboratory tests	Number of tests	Cost to VA	Questionnaire	Questionnaire
6. Outpatient pharmacy	Prescription	Cost to VA	Questionnaire	Questionnaire
7. Prosthetics	Prosthetic device	Cost to VA	Questionnaire	Questionnaire
8. Transportation	Trip	Cost to VA	VA document	ADHC cost model

Other VA Costs

1. Aid and attendance	N.A.	Cost to VA	VA document	VA document
2. Home improvement	Alterations	Cost to VA	VA document	VA document

Health Care Outside the VA – Not Paid by VA

Health care received	Provider's charge for service	Patient questionnaire, provider's bill	Provider's bill
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Home Living Costs – Not Paid by VA

1. Housing, food, transportation	Days living at home	Cost of living	Patient questionnaire	Bureau of Labor Statistics
2. Caretaker and homemaker services	Hours of service	Minimum wage	Patient questionnaire	Bureau of Labor Statistics
3. Structural changes	Structural changes	Charge for structural changes	Patient questionnaire	Contractor's bill
4. Equipment	Equipment	Charge for equipment	Patient questionnaire	Bill for equipment

are available to determine use of services and to make reasonable estimates of cost. The wide variety of services and types of provider records has required the use of six methods for obtaining utilization data:

1. A monthly report, completed by the ADHC program, is used to record each patient's days of attendance at the ADHC and the mode of transportation used.
2. A program has been developed to extract data from the VA's new Decentralized Hospital Computer Program (DHCP), a computerized patient data base. From the DHCP, information on use of hospital, pharmacy, laboratory, and ambulatory services is obtained for each subject. Extraction of information from the DHCP avoids the need to abstract data by hand from medical records and is potentially less time consuming and more accurate.
3. Because VA nursing home, contract nursing home, hospital-based home care, and prosthetics services are not computerized, paper files of these services are examined to determine utilization.
4. At in-person interviews, patients and caregivers are given a calendar to use in keeping a log of all of the patient's health services, and to collect all bills associated with those services. Patients are also contacted by telephone, at one, three, and nine months post-intake; they are reminded to complete the log and are asked a few questions about use of services.
5. Questions in the patient and caregiver in-person interviews are designed to determine the amount of caregiver time devoted to the patient, travel distance to health care facilities, and the sources and amounts of services received outside VA.
6. Finally, because patient and caregiver recall may not provide us with an accurate accounting of the patient's utilization or costs, a letter is sent to each non-VA provider requesting information on the amount of care received (e.g., days of hospitalization, number of office visits) and the associated charges.

The most accurate methods for measuring the cost of services involve determining all of the direct and indirect resources (e.g., personnel, equipment, supplies, utilities, administrative support) that go

into providing a service and then summing the costs of those resources (Williams et al. 1982; Finkler 1979). While one would like to use this method for all measures of cost, the effort required would be prohibitive. Because ADHC was a new service for VA, no proxy for costs of ADHC was available. Therefore, we collected detailed resource data to estimate the cost per day of ADHC at the four sites. Managers in the ADHCs and fiscal officers at the medical centers responded to annual mail questionnaires about their operating costs. A detailed cost model was developed to identify variables (e.g., staff time, supplies, equipment) and fixed (e.g., medical center administration, maintenance) costs that are experienced at the study ADHCs. The model is used to determine a per diem rate for ADHC.

Other methods are used to assess the cost of other services. The rate that each medical center is reimbursed is used as the estimate of the per unit cost for both VA nursing home and hospital care. For VA nursing homes, the Resource Utilization Group II (RUGII) method developed by Fries and colleagues (Fries et al. 1989) and adopted by VA for reimbursement is used to adjust for differences between patients in the amount of resources used. For VA hospitals, the DRGs, adjusted by length of stay, are used to determine hospital costs.

For ambulatory care, hospital-based home care, laboratory, and pharmacy, VA's cost-accounting system (VA "Report of Medical Care Distribution Accounts," RCS 10-0141) is used to estimate the cost of each unit of care provided to the patient. For example, the cost of a single ambulatory care visit within each of seven categories (e.g., medicine, surgery, special psychiatric treatment, rehabilitation, dental) is determined from the accounting system. For services outside VA, such as contract nursing homes and contract ADHC, the actual contract rate that VA pays for each patient is used as the estimate of the unit cost.

For outpatient services provided outside VA, several types of services were evaluated. Studies of the cost of ambulatory care within VA suggest that most of the variation in cost can be captured with three classes of variables: the number of ambulatory visits, the cost of laboratory tests, and the cost of medications prescribed (Koepsell 1986; Charles 1985; Friedman et al. 1985). For this reason, data on the use and cost of ambulatory visits, laboratory tests, and outpatient pharmacy are used to characterize the cost of ambulatory care.

5. WHAT INFORMATION WOULD HELP IN DEVELOPING STRATEGIES TO MINIMIZE THE COST OF ADHC?

The relative cost of care for patients in an ADHC program can be improved by reducing ADHC operating costs; by increasing the substitution of ADHC care for hospital, nursing home, ambulatory, and other services; or by reducing the use of ADHC services themselves. Two cost models have been developed to examine the implications of specific changes in ADHC services and other health care utilization for the relative cost of ADHC: (1) a model, using inputs, of cost (staff, supplies, transportation, etc.) within the ADHC; and (2) a model of utilization of ADHC and the substitution of ADHC for other care (e.g., hospital, nursing home, ambulatory care). The data collected for the models are designed to provide cost and utilization information to ADHC and medical center managers, helping them develop strategies to minimize costs. Sensitivity analysis is conducted for the components of the models to project the effects on total costs of proposed cost-control strategies.

DISCUSSION

In this article, we attempt to present some of the problems faced, approaches taken, and lessons learned from five years of research on the evaluation of Adult Day Health Care. Many issues remain unresolved and are discussed here as directions for future research.

The procedures described in this article were successful in enrolling 826 patients over an 18-month period with a very intensive effort. One area for future research is gaining further understanding of the enrollment process to determine if methods could be developed to increase the efficiency of the process. There are two ways to increase enrollment: increase the number of *appropriate* referrals and increase the number of patients referred who actually enter the program/study. The most efficient way to increase the number of appropriate patients referred would be to institute a system whereby all patients in need of any long-term care upon hospital discharge would be reviewed by a professional or a professional team that would collect or review patient assessment data and decide whether the patient would be referred to nursing home, home care, ADHC, or the other programs available.

The utility of our criteria set predicting the risk of nursing home placement at discharge could be assessed for use in guiding the selection of patients to be reviewed.

The second method for increasing enrollment is to change both the methods used to convince appropriate patients to enroll in the program and aspects of the program itself that decrease patient interest. We are currently conducting analyses comparing the characteristics of patients participating in the program/study with those who were referred but did not agree to participate. We will compare demographic, living-situation, and health status characteristics, as well as the characteristics of the referral process (how the patient was located, discipline of the referring source) and the reasons for patient refusal. We will make the same comparisons between patients who enter the program and stay until discharged, and those who drop out. More information about patient decision making regarding program participation should increase our understanding of the types of patients who may need extra attention, the approaches that may be most fruitful and, perhaps most importantly, the aspects of the program that should be changed to increase patient interest. We must note that it would not be appropriate to assume that all referred patients, even those who meet program admission criteria, "should" be in the program and that our task is to convince every one of them to enter it, especially at a time when we have no evidence of program effectiveness.

Turning to the measurement of patient health status, two issues that require future research are (1) determining the effect of substitution of proxy assessment of patient health status when the patient is unable to respond, and (2) finding ways to reduce the size of the assessment battery while still obtaining sufficient information to answer questions related to efficacy of long-term health care programs in this population. The first issue is especially relevant to the frail elderly because a large portion of these patients are not able to respond for themselves or become unable to do so over the course of a longitudinal study. If patient-generated and proxy-generated scores are biased or not highly correlated, substitution may lead to misinterpretation of functional outcomes. The literature suggests that patient- and proxy-generated scores are biased in that patients consistently rate themselves as less impaired than proxies (Rubenstein et al. 1984; Magaziner, Simonsick, Kashner, et al. 1988). Further work in understanding this phenomenon could lead to changes in questionnaire development that would improve congruence and thus allow for substitution when necessary.

The issue of reduction in the size of the assessment battery is

especially important because of the frailty of the respondents. As the body of literature grows regarding the health status of this population and expected outcomes in long-term care, we can expect more precision in both research questions and program goals, making it less necessary to field very broad assessment batteries. Future research efforts should be aimed at developing such precision.

The utilization and cost section of this study presents a potential for methodological advances in several areas. First is our use of an existing computerized information system, VA's Decentralized Hospital Computer Program, to obtain patient-specific research data. This represents a major potential improvement in accuracy and efficiency over hand extraction of data from medical records. The validity and reliability of these data are being evaluated in this study, but a comprehensive multisite assessment of differences between the computer program and chart review data could be a profitable topic for future research.

Next, the study explicitly evaluates and compares the impact of ADHC from three different perspectives: VA, all payers (patient, Medicare, Medicaid, other third party), and total health care costs plus the costs of the patient living at home in terms of the patient's family. This kind of approach is important to expand our understanding of cost tradeoffs that occur among various parties with the introduction of new services. It also recognizes the need to determine when a patient's use of a new type of service reduces the cost to the payer through shifting costs to the patient and family.

We present a combination of approaches to the measurement of the cost of the various services offered in a non-fee-for-service system such as VA. These approaches include the use of detailed questionnaires and resulting cost models, reimbursement rates, the Resource Utilization Group II method (Fries et al. 1989), diagnosis-related group adjusted for length of stay, and VA cost reports. These methods can be applied to capitated systems such as HMOs. This study will determine the sensitivity of total cost to various assumptions. Future research can examine in detail the accuracy of the assumption that, for instance, the cost of hospitalization is reflected in the DRG adjusted for length of stay.

Finally, a methodological advance applied in this study is the use of cost modeling to help ADHC managers develop strategies that improve the program's efficiency. The results of previous studies were used to develop cost models that project the implication of specific changes in ADHC and other service use and costs for the relative cost of care of patients in the ADHC group. These models were presented

to ADHC managers to aid them in developing strategies to improve program efficiency. Future research can explore factors facilitating or preventing managers from making programmatic changes and ways in which cost information can best be used to facilitate such changes.

In the course of this evaluation, the effectiveness and efficiency of the methodological approaches applied here will be monitored and assessed, resulting in information about the utility of approaches to common research issues. The Adult Day Health Care Evaluation will also result in valid information about the medical efficacy and cost effectiveness of this important program. The evaluation was designed to take advantage of an unusual opportunity to conduct a health services research study that would meet scientific scrutiny and affect program management at two levels. The timing and design of the study will provide information that is useful to program managers and clinicians as well as to Congress, which has mandated a study to inform its future deliberations about program size and content.

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