(2)

Results from the Evaluation of the Massachusetts Nursing Home Connection Program

Joan L. Buchanan, Robert L. Kane,
Judith Garrard, Robert M. Bell,
Christina Witsberger, Alan Rosenfeld,
Carol Skay, Deborah Gifford

The RAND Corporation The University of Minnesota School of Public Health The Boston University School of Public Health

The work described in this report was conducted jointly by The RAND Corporation, the University of Minnesota School of Public Health, and Boston University School of Public Health. The Health Care Financing Administration funded RAND's participation. The Pew Charitable Trusts supported Minnesota's involvement and both the Boston Foundation and the Cox Memorial Trust provided funding to Boston University for its role.

ISBN: 0-8330-1018-2

Published by The RAND Corporation
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90406-2138

JR-01

Results from the Evaluation of the Massachusetts Nursing Home Connection Program

Joan L. Buchanan, Robert L. Kane,
Judith Garrard, Robert M. Bell,
Christina Witsberger, Alan Rosenfeld,
Carol Skay, Deborah Gifford

October 1989

Prepared for the

Health Care Financing Administration,
U.S. Department of Health & Human Services

Pew Charitable Trusts

Boston Foundation

Cox Memorial Trust

The RAND Corporation □ The University of Minnesota School of Public Health □ The Boston University School of Public Health

PREFACE

This report evaluates a nursing home demonstration project on the use of nurse practitioners and physician assistants to improve quality of care in nursing homes. Demonstration waivers provided reimbursement to the mid-level providers working under the supervision of physicians and relaxed restrictions on billing frequency. The results should prove useful to the Health Care Financing Administration, the agency paying these health care bills; to congressional staff considering new legislation on reimbursement for mid-level providers; and to the professional associations advocating the need for new legislation on provider reimbursement.

The evaluation was conducted jointly by The RAND Corporation, the University of Minnesota School of Public Health, and Boston University School of Public Health. The Health Care Financing Administration funded RAND's participation in the evaluation. The Pew Charitable Trusts supported Minnesota's involvement and both the Boston Foundation and the Cox Memorial Trust provided funding to Boston University for its role.

Other publications describing the project are J. L. Buchanan et al., *A Matched Sampling Algorithm for the Nursing Home Connection Demonstration*, N-2823-HCFA, July 1989 and J. L. Buchanan et al., *Provider Visit Patterns to Nursing Home Patients*, N-2824-HCFA, June 1989.

SUMMARY

The Nursing Home Connection, a demonstration project, tests the use of nurse practitioners and physician assistants (NP/PAs) to improve quality of care in nursing homes. Within the project, physicians retain overall responsibility for patient care programs; however, NP/PAs perform duties and responsibilities delegated under 15 written protocols, including ordering tests, special diets, and rehabilitation therapy; and adjusting medications upon oral orders from the attending physician. The project obtained waivers from the Health Care Financing Administration (HCFA) that permit Medicare and Medicaid reimbursement for nursing home visits by NP/PAs and remove restrictions on billing frequency. Beginning in 1985 with sponsorship from the Massachusetts Department of Public Welfare, the project grew out of a medical paradigm developed by the Urban Medical Group, a group practice of primary care physicians and mid-level providers.

The RAND Corporation, and the Schools of Public Health at the University of Minnesota and Boston University, evaluated this project. RAND had responsibility for the sampling design and the cost analyses. The University of Minnesota School of Public Health conducted the quality of care and outcomes analyses. Boston University designed and implemented the nursing home satisfaction survey. The results of all three components are reported here.

This program, which encourages the use of NP/PAs for primary care in nursing homes, achieved modest improvements in quality of care without increasing costs. Further, both nursing home administrators and directors of nursing homes expressed higher levels of satisfaction with the process of care delivered under the demonstration model.

GENERAL DESIGN

Sixteen provider groups participated in the demonstration. The evaluation concentrated on the 15 new provider groups and did not include the Urban Medical Group, which was excluded because it had previously been found to be cost effective and because it accounted for nearly half of the demonstration's enrollment and would dominate conclusions. Further, the evaluation aimed to determine whether the Urban Medical Group model could be successfully transferred to new provider groups.

The control group population, patients treated in the traditional manner, were drawn from nursing homes in eastern Massachusetts that did not participate in the demonstration. Control patients were selected to match demonstration patients on (1) time in nursing home before enrolling in the demonstration; (2) measures of previous medical care use, intended to serve as proxy measures for patient severity; (3) demographic characteristics such as age and sex; and (4) nursing home characteristics such as size, location, and type of ownership.

For all analyses we divided the patient population into those who were admitted to nursing homes before enrolling in the demonstration (rollovers) and those who were admitted to the demonstration and enrolled in the program at approximately the same time (admissions). These two types of patients have distinct patterns and levels of expenditures and we initially hypothesized that the demonstration might differentially affect the two groups. Our sample included approximately 2600 patients, 2000 from the rollover group and 600 from the admission group. Because participation in the demonstration was open primarily to patients who

were eligible for both Medicare and Medicaid, most patients fall into the rollover group. The markedly larger sample of rollovers makes it much easier to detect differences in that group than in the smaller, new admission group.

The set of demonstration patients came from approximately 75 nursing homes, and the control population was drawn from some 125 different nursing homes. The large number of nursing homes in the evaluation meant that there was little clustering of patients within nursing homes and that individual nursing home policies would not significantly affect our conclusions.

QUALITY OF CARE RESULTS

Trained registered nurses, using a standardized tool perfected in a previous study, abstracted the medical records of the samples. The medical record data collected information at the time of admission to the nursing home, three months after admission, and at discharge (or end of study). For the rollovers, the midpoint data was collected at the time of transfer to the new system of care. The basic comparisons were from admission to discharge for the new admissions, and from transfer to discharge (with original admission status used as a covariate) for the rollovers. Regressions were used to correct for differences between the demonstration and control cases on several variables.

There were few differences in change in functional status or in the use of medications. Demonstration patients received more medical attention, as seen in both more visits and more written orders, but fewer telephone orders. Among a set of tracer conditions (six conditions for rollovers and seven for new admits) created to look for differences in quality of care, demonstration patients had significantly better scores on three. NP/PA patients in the rollover group had lower hospital admission rates, fewer emergency inpatient days, and fewer total days than control group patients. Discharge outcomes were quite similar. Logistic regressions showed that among those alive at discharge or the end of the study, rollovers in the demonstration group were less likely to go to the community.

COST RESULTS

For the cost analyses, we compared Medicare and Medicaid claims data for patients treated by MD/NP/PA teams with claims of patients treated by physicians only. Because nursing home costs constitute the largest cost burden for the elderly on the Medicaid program, we compared the length of nursing home stays between the demonstration and control groups to determine whether this intervention affected nursing home costs. We found no differences on this dimension.

Our second set of analyses compared total expenditures per study day for other than nursing home services. For rollover patients the demonstration produced substantially fewer very low cost and very high cost patients, an important finding. Additional efforts to better target the patients at highest risk may make the program more cost effective. Multivariate analyses comparing the demonstration and control groups indicated that although demonstration patients consistently had somewhat lower total expenditures per study day, these differences were never statistically significant. Lower hospital costs for demonstration patients constituted most of the difference. The difference in hospital costs per study day was statistically significant for rollovers when all patients were weighted equally. However, the greatest differences in hospital costs per study day occurred for those rollovers who had relatively short stays

within the study period. When hospital costs per study day were weighted by the number of study days (nursing home days plus study days), the difference was no longer significant. Thus, the reductions for those who appeared most affected were not large enough for us to conclude that the demonstration significantly lowered the total costs of hospitalization.

The demonstration shows clear positive signs of movement in a cost-effective direction, by reducing both the variation in charges per study day and hospital expenditures per study day for rollovers. However, at the present time, we must conclude that the program is cost neutral, as the movements are neither large enough nor extensive enough to achieve statistical significance for the entire program.

NURSING HOME SATISFACTION RESULTS

We surveyed directors of nursing and administrators of nursing homes in which patients received both traditional physician only care and MD/NP/PA provider team care. Eligible administrators and directors of nursing in homes participating in the demonstration were asked to compare the two models in terms of various components of quality of medical care delivered in their homes. Of the 134 eligible respondents, 85 percent replied.

At least 75 percent of the respondents preferred the MD/NP/PA model to the traditional physician only model. In no case did more than 4 percent respond negatively to the waivered program.

Respondents frequently mentioned several themes supporting their preference for the MD/NP/PA provider groups over traditional practice, including greater presence in the nursing home by NP/PAs, more response to telephone calls and changes in clinical status; more timely and better record keeping and record review; greater personal time and attention given to patients; increased teaching activity with nursing home staff; and better communication among staff, family, and physician.

ACKNOWLEDGMENTS

Among the many individuals who provided the data and information to make this analysis possible, the authors are particularly indebted to Robert Master, M.D., Sarah Parker, and Joel Kallich of the Massachusetts Department of Public Welfare.

Tony Hausner, HCFA project officer, was most helpful throughout the course of the study. We would also like to express our appreciation to all of the evaluation sponsors, the Health Care Financing Administration, that funded this analysis and all of the RAND research associated with the project; the PEW Charitable Trusts for their support to the School of Public Health, University of Minnesota; and the Boston Foundation and the Cox Memorial Trust for their support to the School of Public Health, Boston University.

Helpful comments from RAND colleagues Susan D. Hosek and Gerald F. Kominski contributed to the presentation of this material.

CONTENTS

FIGURES

TABLES

I. INTRODUCTION

Concern over the quality of care in nursing homes continues to receive national attention. One potential solution to some of the problems in nursing homes is the introduction of mid-level providers such as physician assistants (PAs) and nurse practitioners (NPs). In theory, these mid-level providers would enhance the amount and quality of medical and nursing attention that patients receive.

Several demonstration projects, currently underway or recently completed, look at these providers in a variety of roles associated with nursing home patients. Some were restricted to nurse practitioners who trained in special programs or in programs with an emphasis on gerontology or geriatrics (GNPs), others were not. The Mountain States Geriatric Nurse Practitioner Project, sponsored by the W. K. Kellogg Foundation, introduced GNPs, trained through a continuing education model, as nursing home employees. The Robert Wood Johnson Foundation's Teaching Nursing Home Project introduces students preparing for masters degrees in gerontological nursing and the faculty who train them into the nursing home as part of teams of new providers. The Massachusetts Nursing Home Connection Project uses physician assistants and predominantly masters prepared nurse practitioners but does not require training in gerontology. Within this project, these mid-level providers are employed by physician groups to provide much of the primary care required by nursing home patients. The Nursing Home Connection is somewhat different from the previous two projects, because in it the mid-level providers act more as physician substitutes offering an enhanced medical presence within the nursing home. In the other projects, the emphasis is on more nursing attention and skill augmentation.

Previous studies have clearly established that mid-level providers, operating in primary care settings within their areas of training, can deliver care that is at least comparable to that of physicians (see Lee et al., 1983; and Sox, 1979, for summaries of this literature). The use of mid-level providers in nursing homes has been less studied, although the few available studies affirm this finding for nursing home patients as well (see Kane et al., 1976, 1989; Master et al., 1980).

Results on cost-effectiveness in primary care settings have been less conclusive (Buchanan and Hosek, 1983; Lee et al., 1983; Record et al., 1980; Reinhardt, 1973). For the nursing home population, results suggest the possibility of cost savings but either fail to be statistically rigorous (Kane et al., 1976, and Kavesh, Mark, and Kearney, 1984, report mean costs without tests of statistical significance) or fail to be statistically robust (Buchanan et al., 1989a, found evidence of savings in some subgroups of patients with unusually large pre-demonstration costs but could not rule out regression to the mean).

PROJECT HISTORY

The Nursing Home Connection Program grew out of a late 1970s project to extend medical care options and develop better continuity of care for Boston's urban elderly and chronically ill, populations with complex medical care needs that were inadequately served as physicians withdrew from inner city practice. (See Master et al., 1980, for a more complete description of this project.) The original project began as a collaborative effort involving the

Urban Medical Group (a group practice with primary care physicians and mid-level practitioners), four inner city neighborhood health centers, a hospital, and the city and state governments. The use of nurse practitioners and physician assistants to meet many of the medical care needs of subgroups of the elderly, particularly the nursing home and homebound populations, was a cornerstone of the project.

A Medicaid contract provided reimbursement to nurse practitioners and physician assistants for medical visits to nursing home patients eligible for Medicaid. The project obtained Medicaid waivers for regulations that prevented the use of nonphysicians for the delivery of primary care services in nursing homes. The waivers were intended to remove the potential risk of loss of licensure by nursing homes participating in the program.

Workload statistics from the project indicated that a well-trained physician assistant or nurse practitioner could handle a caseload of 120 to 130 nursing home patients per year, or 40 to 50 homebound patients, and that the nursing home component of the program was nearing financial viability (Master et al., 1980).

THE CURRENT DEMONSTRATION

Sponsored by the Massachusetts Department of Public Welfare, the current project extends the program to 16 provider groups, 15 new groups and the original Urban Medical Group. Each provider group included or expanded to include a nurse practitioner or physician assistant to assist in the treatment of nursing home patients. Participating provider groups were required to obtain agreements, formalized as a "memorandum of understanding" with the Department of Public Welfare, from each of the nursing homes willing to participate in the program. The provider groups were free to approach any nursing home willing to accept Medicaid patients. For the most part, the provider groups approached only those nursing homes where they currently saw patients. Approximately 125 nursing homes, all located in eastern Massachusetts and Medicaid certified, signed the agreements.

The new provider groups began enrollment in two waves; the first wave initiated enrollment activities in January 1985 and the second approximately six months later. To be eligible for program participation, patients had to be eligible for Medicaid, or be Medicare eligible and "nearly" eligible for Medicaid. The vast majority of participants were Medicare beneficiaries.

Early program enrollees were predominantly long term nursing home residents already under the care of participating physicians. Although newly admitted nursing home patients became more common as the demonstration matured, longer term nursing home residents who spent large portions of their assets before becoming Medicaid eligible continued to dominate the enrollments. As a result, longer term, continuing nursing home residents form the largest component of the evaluation sample. The latter is important both because new admissions and long term residents have quite different patterns of medical service use (Buchanan et al., 1989a) and because project clinicians hypothesized that the program could affect newly admitted patients more than continuing residents.

As the largest provider group and the only one with an established program, Urban Medical Group enrollments were three to four times as large as the second largest group and accounted for nearly half of all enrollments. Because the evaluation aimed to determine whether the Urban Medical Group Model could be successfully transferred to new provider groups, the evaluation sample is limited to patients from new provider groups.

THE INTERVENTION

This demonstration project, sponsored by the Massachusetts Department of Public Welfare, promotes the use of nurse practitioners and physician assistants working under the supervision of physicians to render primary care to nursing home patients. Within the project physicians retain overall responsibility for each patient's program of care; however, NP/PAs perform duties and responsibilities delegated by physicians under written protocols. The duties and responsibilities include ordering tests, special diets, and rehabilitation therapy as prescribed in the protocols, as well as adjusting medications upon oral orders from the attending physician. The 15 established protocols covered bronchitis and pneumonia, cellulitis, chronic obstructive lung disease, congestive heart failure, constipation, degenerative joint disease, fever, fractures, gastritis, peptic ulcer disease, urinary tract infection, anemia, dementia and altered mental status, decubitis ulcer, and diabetes mellitus.

At a demonstration patient's admission to the nursing home, the NP/PA performs the required physical exam and medical evaluation and develops the medical care plan. The responsible physician must review and countersign the plan within 10 days for patients classified as requiring skilled nursing care and 30 days for patients requiring only intermediate levels of nursing care. At that time the physician repeats the physical exam and medical evaluation. As with admissions, responsibility for transfer and discharge procedures are also delegated to NP/PAs.

NP/PAs are also allowed to do the required periodic patient reevaluation and reexamination (every 30 days for skilled patients and every 60-90 days for intermediate level patients) as well as review of the medical care plan. NP/PAs must also record patient progress notes after each visit. Physicians must review and countersign the notes every six months for skilled patients and once every 12 months for intermediate level patients. This physician review is usually handled during regular periodic patient rounds conducted with the NP/PAs. The rounds are a learning opportunity for the mid-level providers.

Participating nursing homes are instructed to call NP/PAs with all patient problems. NP/PAs contact physicians as necessary for further consultation or instructions. Responsibility for night calls was also originally delegated to NP/PAs, but experience revealed that most night calls required physician attention so the function reverted to physician coverage.

To implement these features of the program without jeopardizing licensure within participating nursing homes, waivers of relevant long term care facility regulations were obtained from the Health Care Financing Administration (HCFA).

Additional waivers provided both Medicare and Medicaid program reimbursement for NP/PA visits to nursing home patients. The addition of Medicare reimbursement provisions shifts primary payment for the project services from the Medicaid program to the Medicare program. Within the project all nursing home visits were reimbursed at the same rate, whether from physicians, NPs, or PAs. Medicare reimbursements for the demonstration services were processed through the Office of Operations Support (OOS) at HCFA. Special processing procedures at OOS also remove customary restrictions on billing frequency for nursing home visits to facilitate payments for visits in response to episodic problems.

EVALUATION HYPOTHESES

The Health Care Financing Administration together with the Pew Charitable Trusts, the Boston Foundation, and the Cox Foundation sponsored this evaluation of the Nursing Home

Connection Demonstration. The evaluation was jointly conducted by The RAND Corporation, University of Minnesota School of Public Health, and Boston University School of Public Health.

Two key features of the intervention—the set of clinical protocols and the opportunity to enhance the medical presence within nursing homes—led to the evaluation hypotheses presented below. Together these features should provide better disease management and better drug utilization programs, and possibly increase patient functional status. To the extent that these goals of better clinical management were achieved, patients could have better outcomes, such as lower mortality rates and increased likelihood of being discharged home. At the same time, improved clinical management should avert unnecessary hospitalizations and potentially reduce the costs of medical care. Greater access to primary care providers should also reduce unnecessary utilization of emergency rooms.

Hypotheses proposed and tested by the evaluators were that patients treated by teams with NP/PAs

- Have better managed disease conditions.
- Have better functional status outcomes.
- Show evidence of more efficient drug utilization.
- Are more likely to be discharged home.
- Have lower mortality rates.
- Have fewer visits to emergency rooms.
- Have fewer hospital admissions and fewer hospital days.
- Have lower total medical care claims for services other than routine nursing home care.
- Have lower hospital claims.
- Have lower Medicare reimbursements.
- Have lower Medicaid reimbursements for other than routine nursing home care.

EVALUATION DATA COLLECTION STRATEGY

The evaluation collected eligibility and claims data from both the Medicare and Medicaid programs as well as nursing home data from the Massachusetts Medicaid Medical Information System. Demonstration enrollment data were also provided by the Massachusetts Department of Public Welfare. The claims data we received covered the time between January 1984 and June 1987. The Medicaid claims data were not available for the sampling phase of the project, but Medicare claims and the enrollment and eligibility data were.

To obtain clinical and functional status data, the evaluation abstracted data from nursing home medical records for all patients (treatment and control) included in the evaluation. For patients who resided in nursing homes before their enrollment, data were collected for that period as well. Data abstracted from the medical records included diagnoses, drug utilization, use of medical and rehabilitation services, functional status, use of nursing therapies, and treatment patterns for a series of tracer conditions.

Nursing home administrators and directors of nursing in the demonstration nursing homes were surveyed by mail to learn about their satisfaction with the program.

DEFINITION OF STUDY GROUPS AND EVALUATION TIME FRAMES

Within the evaluation, two types of patients are distinguished: rollovers—patients who were in a nursing home for some time and often under the care of participating physician providers before entering the demonstration; and new admissions—patients who enter the nursing home and the demonstration at approximately the same time. We distinguished these two groups of patients because they had very different patterns of medical care use, and we hypothesized that the intervention might differentially affect the two groups. Our initial hypotheses suggested that NP/PAs might affect those newly admitted more than rollovers. However, in this study, rollovers dominated the sampling frame because of the program requirement that patients be both Medicare and Medicaid eligible. Many nursing home patients spend down into Medicaid eligibility only after their nursing home tenure begins and fall into the rollover class of patients as a result.

In general, the evaluation attempted to collect data on patients from both a pre-period, defined as the year before enrollment in the demonstration, and an evaluation period, the year following enrollment in the demonstration. Not all patients could be followed for this two-year period, and not all data sources contained data on the patients for this time frame.

For the cost analysis, claims data were available for the pre-period, so this period is always a full year. Nursing home medical record data were not available for patients who were newly admitted to the home at the time of their enrollment. In other cases, patients were admitted at some time after the pre-period began but before enrollment in the demonstration. For these patients, pre-period medical record data began [illegible] the admission date and went through the enrollment. For patients admitted to a nursing home more than a year before enrollment in the demonstration, the pre-period was limited to one year.

For both the cost and the medical record data, the evaluation period is terminated early if the patient is (1) discharged to the hospital for more than 30 days, (2) transferred to another nursing home, or (3) discharged to the community. An exception occurs in the cost analysis, which includes charges for the discharge hospitalization.

ORGANIZATION

Section II, on methods, describes the matched sampling strategy, the quality of the resultant matched samples, the nursing home medical record review data collection effort, and a cross-validation exercise that compared the record review data with the combined Medicare and Medicaid claims data on hospitalizations. The sampling strategy was designed by The RAND Corporation; and the record review data collection, designed by the University of Minnesota School of Public Health, was implemented under the direction of the School of Public Health at Boston University.

Findings on functional status outcomes, use of medications, amounts of medical attention, and quality of care, are contained in Sec. III. These analyses were performed by the University of Minnesota School of Public Health.

Section IV presents the results from The RAND Corporation's cost study. Medicare and Medicaid claims data are analyzed, and casemix measures drawn from the medical record review data are introduced as independent covariates for the regression analyses.

The results of a small survey on program satisfaction collected from nursing home administrators and directors of nursing in participating nursing homes are reported in Sec. V. The survey was designed, conducted, and analyzed by the Boston University School of Public Health.

Study conclusions and recommendations are found in Sec. VI.

II. SAMPLING DESIGN AND METHODS

SELECTING THE DEMONSTRATION AND CONTROL SAMPLES

Like many demonstration programs, the Nursing Home Connection was initiated well before an evaluation team was selected. As a consequence, a randomized evaluation design strategy was infeasible and design options were limited to strategies for selecting a control population that was "comparable" to the demonstration population. If a demonstration population is similar to the universe of eligibles, then a random sample from the set of possible controls is adequate. However, if the demonstration population is thought to be a special subset of the universe of eligibles, a randomly selected control population will not be comparable to the demonstration population. Awareness of the selection process for the demonstration population and the availability of appropriate types of data on the potential control population in part determine the best strategy for selecting controls.

The early experience of Urban Medical Group providers suggested that the demonstration might have high penetration in some nursing homes and that the sickest patients within a home would be referred to the participating groups. The latter was thought to occur because the NP/PAs established a greater medical presence within the participating nursing homes than physicians working alone were likely to provide. As a result, nursing homes frequently referred or encouraged patients with more serious problems to enroll in the demonstration. This Urban Medical Group experience led us to believe that demonstration enrollees might not be a random subset of all nursing home patients but might constitute instead a group of "sicker than average" patients. To address these concerns we decided not to include patients from the demonstration's nursing homes in the control sample; we developed a sampling method that allowed us to match patients from nonparticipating nursing homes on measures intended to approximate severity of illness.

Demonstration providers secured agreements to participate in the demonstration from interested nursing homes in which they practiced. Approximately 120 nursing homes, around one-third of the eligible homes in the state, agreed to participate in the program. The evaluation restricted its patient sample to new provider groups and further required that the groups not have previously employed an NP/PA in the demonstration capacity. To be included in the evaluation, patients had to be at least 66 years of age at enrollment and to have had some (either Part A or Part B) Medicare eligibility in the pre-period. The age and Medicare requirements were imposed to ensure the availability of Medicare utilization data for the pre-period matching in the selection of "comparable" controls. All patients enrolled with new groups between January 1985 and June 1986 who met these criteria were included in the evaluation. Approximately 1350 patients in total were drawn from 75 nursing homes.

Preliminary Sampling at the Nursing Home Level

The potential control sample included over 20,000 patients from nearly 300 nursing homes. A preliminary sampling at the nursing home level was undertaken to limit the number of nursing homes in the final control sample. This step was necessary to better approximate the demonstration sample and to control the costs of the medical record abstraction phase of the evaluation. Because a preliminary analysis showed that larger nursing homes were more likely to participate in the demonstration, we used a stratified sampling of homes to control the total number of eligible homes and to ensure that the controls were, on average, selected

from larger than average homes. This step left us with over 10,000 patients from approximately 150 eligible nursing homes for the control population; 125 were eventually included as a result of patient level matching.

Two types of data were available for sample matching: the Medicaid eligibility data that provided some indication of what nursing home the patient was in and the duration of institutionalization; and the Medicare claims data that provided information on previous use of medical services.

Ensuring Concurrent Time Frames

Previous studies on nursing home patients have shown that use of medical services is much lower for patients who have been institutionalized for some time than for newly admitted patients (Buchanan et al., 1989a). This and the observation that utilization patterns change through time led us to designate separate pools of eligible control patients for each demonstration patient. Two criteria were established for selecting the pools. First, the eligible control had to be in a nursing home during the month that the demonstration patient enrolled in the program. Second, the pool of eligible controls had to have entered nursing homes at approximately the same time as the demonstration patients. Together these requirements ensured that demonstration patients and the selected controls would be drawn from the same time frame and would have approximately the same lengths of previous nursing home stay.

Each control patient was assigned an artificial enrollment date that corresponded to its matched demonstration patient's actual enrollment date. These dates marked the beginning of the evaluation period for each patient. The year before this date was designated as the pre-period. For patients who enrolled in the demonstration when they entered a nursing home, this pre-period is entirely outside the nursing home. For other patients, the pre-period may include both nursing home stays and community stays.

The Matching Algorithm—Based on Economic and Eligibility Data

Once a pool of eligible control patients was designated for a particular demonstration patient, our matching algorithm, a two-dimensional variant of propensity score matching, selected a control patient from the eligible pool. The matching algorithm scored patients along two dimensions, one a proxy severity measure constructed from patient characteristics (age and sex) and a set of measures of previous medical care use. This proxy severity score was constructed from a regression model that used a combination of measures of previous use of medical services to best predict future use. The second dimension for matching constructed a participation propensity score based on nursing home characteristics. After scoring patients on both dimensions, scored patients were divided into quintiles along the severity dimension and terciles along the nursing home dimension. These cutpoints created 15 strata within the pool of eligible controls. The last step randomly selected a control from the same strata as the demonstration patient.

The subset of controls selected by our matching procedure was more comparable to the demonstration population on the available measures than to the universe of potential controls. Greater emphasis in the matching was placed on measures of previous use, particularly those that are predictors of future use. Characteristics such as patient age that did not enter strongly into our prediction equations were deemphasized. As a result, the average ages of the demonstration and selected control population differ by one year. A more detailed description of the algorithm and these results are reported in Buchanan et al., 1989b.

In the implementation of our sampling strategy, two samples were actually drawn. Whenever patients from sample 1 could not be located or the nursing home medical records could not be obtained (e.g., because of the sale and closure of the nursing home), patients from sample 2 were used to complete the match. Upon occasion the patient information we had for the purposes of sampling was incorrect and the selected patient did not meet the sampling criteria, so these cases were also replaced.

Comparability of Matched Controls to Demonstration Patients

Table 1 displays the sample comparability on the level of total pre-period Medicare claims. These data are reported separately for patients within five different categories of length of previous nursing home stay to show the quality of the match within subgroups and to illustrate the importance of the duration of previous nursing home stay on the level of medical expenditures.

Sometimes the Medicaid eligibility files contained Medicaid spend down dates in lieu of nursing home admission dates. This shortcoming led us to group patients into the five previous nursing home stay categories shown in Table 1 for the sample construction task. It also introduced some classification error into the sampling task. For demonstration patients, the enrollment date provided additional data to help with this classification. The lack of a real enrollment date in the control group meant that we were more likely to misclassify control patients than demonstration patients. As a consequence, the final control sample had more rollovers and fewer admissions than the demonstration sample (see Table 2).

Final Samples Comparable on Medical Care Utilization Data

A small proportion of the patients in the final sample did not have both Part A and Part B Medicare coverage. As a result, claims data for these cases were not comparable to those for the remaining group; these cases were dropped from further cost analyses. Table 2 shows the final samples for both the cost and the outcomes analyses for demonstration patients and

Table 1

SAMPLE COMPARISONS WITHIN PREVIOUS NURSING HOME STAY CATEGORIES[a]
(Unadjusted dollars)

Length of Previous Nursing Home Stay Category	Total Pre-period Medicare Claims	
	Control Patients	Demonstration Patients
Long-term residents (1 or more years)	$3,199 (210)	$2,703 (179)
Medium-term residents (5–12 months)	9,802 (924)	9,367 (1078)
New residents (1–4 months)	14,793 (1232)	15,128 (1214)
Admissions—previous nursing home bills	14,320 (1905)	15,373 (1628)
Admissions—no previous nursing home bills	15,786 (1356)	17,049 (1304)

[a]Standard errors in parentheses.

Table 2

PRE-PERIOD MEDICARE CLAIMS[a]
(1988 constant dollars)

	Rollovers		Admissions	
	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients
Annual total expenditures	$10,330 (524)	$9,543 (547)	$28,782 (2139)	$31,676 (2085)
Per diem expenditures	$28.29 (1.44)	$26.14 (1.50)	$78.87 (5.86)	$86.78 (5.71)
Claims sample size	1012	961	232	294
Record review sample size	1078	1009	249	315

[a]Standard errors in parentheses.

controls. It also shows the comparison figures for total annual and per diem Medicare claims within the pre-period for each of our subgroups. The matching worked well, as none of the between-group comparisons are statistically significant. However, in our cost analyses we will introduce pre-period values as independent covariates to control for the residual differences not removed in the matching.

Sample Comparability on Clinical and Functional Status Measures

Because data on clinical and functional status were not available, the matching strategy relied entirely on data from medical claims and sociodemographics. As new data became available from the nursing home medical records, we wanted to determine how well our matching strategy performed on clinical and functional dimensions. Table 3 shows the proportion of cases in each subgroup with selected diagnoses commonly found in nursing home populations. The only statistically significant differences were found in the rollover group; demonstration patients had significantly fewer patients with cancer diagnoses and with hip fractures.

We next looked at functional status by examining ability to perform six activities of daily living (ADL) (see Table 4). We found only one statistically significant difference among the 12 comparisons. Within the rollover population the demonstration patients had a significantly higher proportion rated as independent in ambulation, which may follow from the lower frequency of hip fractures within this group. We also compared the subgroups on behavioral functioning and orientation. Within the rollover population, 72 percent were free of behavioral problems, compared with 77 percent for the controls, a statistically significant difference. We also aggregated across the ADLs (see Table 5) to look at the share of patients with different numbers of ADL dependencies to give us a better feeling for more complex functionally dependent cases. Here we observe no differences between the subgroups.

As part of the medical record abstraction task, we abstracted data on the use of different nursing therapies. We have divided the therapies into (1) those that are somewhat discretionary and suggest good or bad quality of care, and (2) those that are less discretionary and

Table 3

PREVALENCE OF SELECTED DIAGNOSES
(Rate per 100 cases)

	Control Patients	Demonstration Patients
Rollovers		
Diseases of nervous system	13	15
Dementia	31	35
CVA	27	29
HIP	18	15[b]
Cancer	07	04[b]
Neurologic disorders	60	62
Depression	03	04
Ischemic heart disease	35	34
Admissions		
Diseases of nervous system	11	13
Dementia	25	27
CVA	30	28
HIP	13	11
Cancer	07	06
Neurologic disorders	56	57
Depression	02	03
Ischemic heart disease	29	30

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

Table 4

PERCENTAGE OF CASES RATED AS REQUIRING NO ASSISTANCE, BY FUNCTIONAL CATEGORY

	Control Patients	Demonstration Patients
Rollovers		
Ambulation	38	43[b]
Transferring	37	40
Feeding	49	49
Bladder control	43	42
Bowel control	54	54
Dressing	11	14
Orientation	37	33
Behavior	77	72[b]
Admissions		
Ambulation	45	43
Transferring	41	38
Feeding	57	56
Bladder control	51	50
Bowel control	61	62
Dressing	14	15
Orientation	43	35
Behavior	79	78

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

Table 5

PERCENTAGE OF CASES BY NUMBER OF ADL DEPENDENCIES

	Control Patients	Demonstration Patients
Rollovers		
None	10	11
1	15	18
2	8	9
3	13	9
4	12	10
5	10	9
6	33	33
	100	100
Average	3.6	3.5
	χ^2 test – N.S.	
Admissions		
None	13	10
1	14	15
2	10	13
3	18	16
4	13	10
5	12	13
6	20	23
	100	100
Average	3.2	3.3
	χ^2 test – N.S.	

signify patient nursing care needs. The first group includes preventive and training tasks that may be affected by the intervention, and the second includes such tasks as catheter and prosthesis care. Among the nursing quality measures we found many differences, perhaps because the program is having a generalized effect (see Table 6). Among the less discretionary nursing therapies we found no differences (see Table 7).

As a final set of comparisons, we looked at the source of newly admitted patients and their casemix using the Minnesota casemix system. For the rollover group, preadmission location and casemix were no longer considered relevant. We looked at preadmission location because other studies have suggested that this is an important determinant of patient needs (see Buchanan et al., 1989a; Lewis et al., 1989). Table 8 shows the comparison; the χ^2 test on the two groups was not significant. Figure 1 displays the casemix comparability.

ABSTRACTING NURSING HOME MEDICAL RECORDS

The data for this study were collected from June through October of 1987 and refer to study timeframes from 1984 through June 1987. A copy of the instrument is reproduced in App. A. The field staff consisted of 17 RNs, many of whom had graduate training in public health or nursing, or were trained as Nurse Practitioners. Most of the RNs had long term care experience.

Table 6

PERCENTAGE OF CASES RECEIVING DISCRETIONARY NURSING THERAPIES IDENTIFIED AS QUALITY OF CARE MEASURES

	Control Patients	Demonstration Patients
Rollovers		
Preventive skin care	35	54[b]
Prevention of decubitus	29	32
Bladder training	9	16[b]
Bowel training	7	11[b]
Gait training	7	7
Range of motion	24	32[b]
Restorative nursing	60	73[b]
Physical restraints	37	43[b]
Admissions		
Preventive skin care	36	50[b]
Prevention of decubitus	22	29[b]
Bladder training	13	15
Bowel training	9	12
Gait training	8	11
Range of motion	15	21[b]
Restorative nursing	62	78[b]
Physical restraints	30	34

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

Training

The staff received a 40-hour intensive training program in the use of the abstracting instrument. The training emphasized identifying the appropriate time periods and interpreting each question. A manual was prepared before training, but several additions were made during the week-long sessions. Didactic sessions included in-depth discussion of each question. In addition, actual medical records from several nonparticipating nursing homes were used as examples to facilitate discussion and to test for inter-rater reliability before staff entered the field. Half-day compulsory meetings were held once per week for the first six weeks to debrief and identify any problems encountered in the field.

Distribution/Assignment of Homes and Records

All of the nursing homes, experimental and control, were located in Eastern Massachusetts, as were the nurse researchers. Nevertheless, to avoid any regional or geographic bias, the nursing homes were assigned to nurses on a random basis. In homes where the number of records surpassed 40, two nurses were assigned. In small facilities, a single nurse abstractor completed all of the abstracts. The potential for researcher bias was controlled through the quality and reliability control mechanisms.

Table 7

PERCENTAGE OF CASES RECEIVING NONDISCRETIONARY NURSING THERAPIES

	Control Patients	Demonstration Patients
Rollovers		
Treatment of decubiti	10	13
Wound care	6	7
Catheter	8	8
Prosthesis care	.4	.2
Tracheostomy care	.0	.1
Respiratory therapy	2	2
Oral suctioning	.6	.7
IV fluid management	.0	.1
Tube feeding	1	2
Gastrostomy/colostomy/ileostomy care	3	3
Pureed diets	10	10
Admissions		
Treatment of decubiti	13	12
Wound care	11	9
Catheter	11	15
Prosthesis care	2	1
Tracheostomy care	0	0
Respiratory therapy	3	4
Oral suctioning	.4	.3
IV fluid management	.0	.6
Tube feeding	1	1
Gastrostomy/colostomy/ileostomy care	3	5
Pureed diets	4	6

Table 8

WHERE NEWLY ADMITTED PATIENTS COME FROM
(Percent of patients)

Admitted from	Control Patients	Demonstration Patients
Hospital	59	59
Long term hospital	8	5
Nursing home	6	9
Rest home	2	1
Home	25	25
Other	.4	.6
	χ^2 test — N.S.	

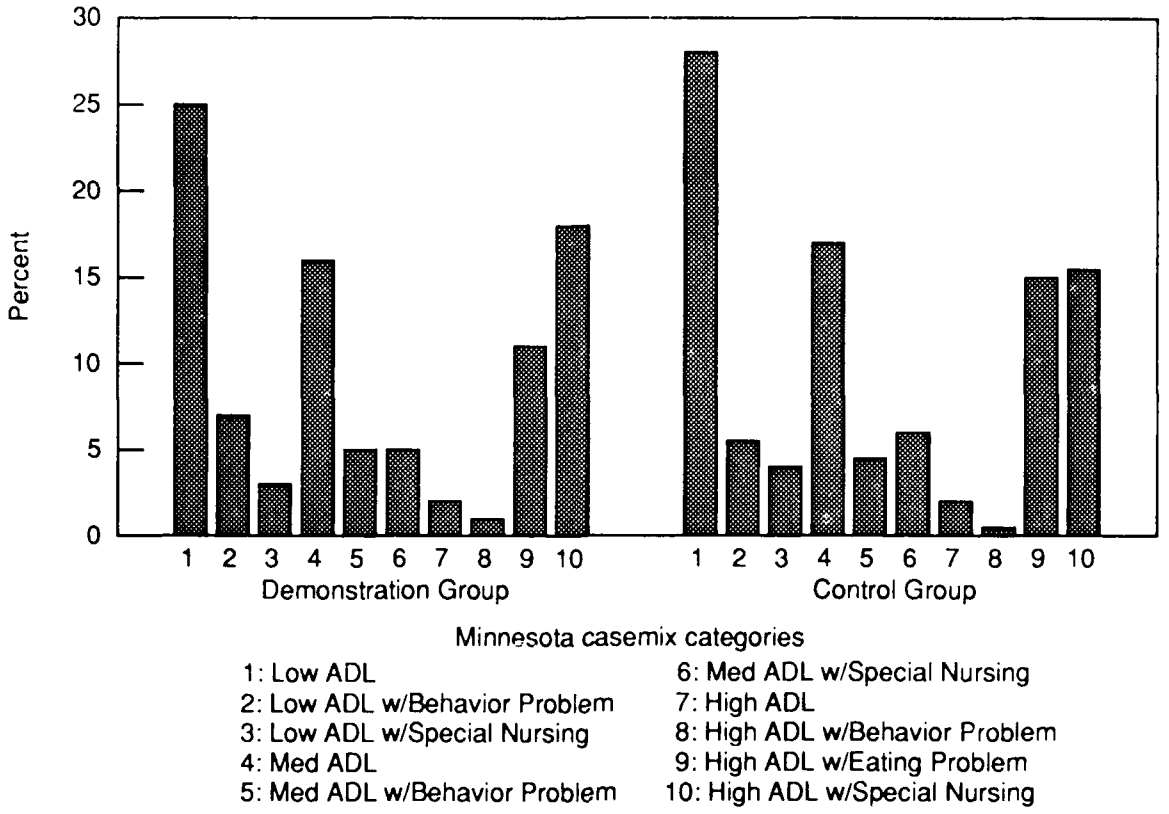


Fig. 1—Comparison of casemix distribution for admissions

Quality Control/Inter-rater Reliability

Quality control fell into two areas, editing and inter-rater reliability. Nursing home records are not research tools and often lack the organization and completeness desired for either clinical or research use. Many records were still active and many others had been inactive for more than two years. Also, the environmental conditions for abstracting records were not always adequate. Consequently, each record abstract was carefully edited not more than one week after the record was reviewed. The editing was done a rotating basis. Protocols emphasized completeness, internal consistency, and appropriate time periods. When errors were identified, the primary data collector was responsible for returning to the facility to correct or complete the information. Records were not accepted for mailing until they had been edited and recorded as complete.

Two rater reliability concerns were addressed in this study. First, because the data collection effort spanned over four months and each abstractor reviewed over 150 records, raters reabstracted three randomly selected records of their own.

Records selected for reabstraction were initially abstracted during the previous six-week period but not less than two weeks before the reabstraction. These intra-rater reliability tests provided a measure of any change in judgment or decision rules by a particular researcher.

In addition, each nurse abstractor was required to reabstract ten additional records during the course of the study as a measurement of inter-rater reliability.

At the Boston site, selected items were chosen for analysis from the entire record for both inter- and intra-rater reliability. For both cases overall reliability (inter-item agreement) was above 80 percent, although specific items were consistently troublesome. Such items were often service utilization counts with the numerical disagreement centering on a single item. Nevertheless, these items were identified for additional discussion at team meetings.

The complete inter- and intra-rater reliability data were then sent to the University of Minnesota for more in-depth analysis.

COMPARING MEDICAL RECORD AND CLAIMS DATA

As a check on the quality of our data, we compared hospitalization data abstracted from the nursing home medical records with those found in the claims data. Results, which we believed were quite good, are shown in Table 9. Within the rollover group the correlation on the number of hospital days found in each source ranged between .91 and .92. For the newly admitted patients it was even higher, .94 to .97. We also looked at how often one source reported a hospitalization and the other did not. In the rollover group, there was disagreement in only 2 percent of the cases. In the newly admitted group the figure rose to almost 4 percent. Missing hospitalizations occurred in both sources of data.

Table 9

COMPARING CLAIMS AND RECORD REVIEW DATA ON HOSPITALIZATIONS

	Rollovers		Admissions	
	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients
Correlation on number of hospital days	.91	.92	.94	.97
Percent disagreement on hospitalization	.018	.022	.036	.035

III. RESULTS ON QUALITY OF CARE

QUALITY MEASURES FROM THE RECORD ABSTRACTS

The medical records of selected patients were abstracted by a team of specially trained nurses. The abstraction form had been developed and tested in a similar study (Kane et al., 1989). The data were collected three times for each subject: admission to the nursing home or study whichever comes earlier, a midpoint, and discharge or end of study. For the rollovers, admission to the study coincided with the nursing home admission for patients who enrolled in the demonstration within their first year in a nursing home. For patients who had been in the nursing home for more than one year, admission to the study was defined to be one year before the demonstration enrollment. The midpoint was the time of conversion to demonstration status (or the comparable point for controls). For the new admissions, the midpoint was three months after admission.

Data were collected on several variables including nursing therapies ordered or needed on admission, functional status, numbers of dose equivalents per two-week period for common medications used in nursing homes, numbers of visits by various providers, tests and services ordered, and use of hospital and emergency rooms. The utilization measures were adjusted for the patients' lengths of stay and expressed as a rate per nursing home day. Discharge outcomes (including still in nursing home at the end of the study period) were compared.

Quality scores constructed from a series of tracer algorithms developed for common nursing home problems were reviewed by an independent clinician panel that assigned values to each component used to develop summary scores. The tracers were developed with careful attention to the limitations of the nursing home records. Only very basic information was collected. These data were arranged in an ordered fashion to test if a clinically relevant sequence was followed. An independent group of clinicians reviewed the algorithms and assigned weights to the different activities possible. The weights were intended to reflect the clinical importance of each step. Both positive and negative scores were possible. The final weights used were the average of the clinicians' individual judgments. Failure to take a critical step eliminated further scoring for that branch, but additional credit could be obtained for other paths. For example, diabetics should have had, at a minimum, checks on their blood or urine sugar and steps taken if the levels were persistently elevated. They should have also received preventive foot care and vision examinations regardless of their blood sugar status. From another case, a patient with persistent fever should have had a physician notified and the physician should have ordered at least basic laboratory measures.

The range of scores was as follows:

Diabetes	−13.7	to	19.3
Congestive failure	−18.4	to	17.9
Hypertension	−10	to	17.4
Chronic urinary incontinence	− 7	to	11.1
Feeding	0	to	11
Fever	− 2.0	to	20.6

STATISTICAL ANALYSIS

The primary comparison used in the study is between the admission and discharge status for the demonstration and control groups. For the rollovers, the analysis uses the midpoint data as the baseline and the admission to the nursing home as a covariate. Because there were some differences between the groups, regression techniques were used to correct for the effects of those variables. For continuous dependent variables, ordinary least squares regression was used; for dichotomous variables, logistic regression was employed. Data are reported with .95 confidence intervals, using two-sided tests.

RESULTS

Functional status was examined for individual ADL and related items and using a composite score based on total number of dependencies. Scaling scores on an individual item ranged from 1–3 for some items up to 1–6 for others. Higher scores denoted greater independence in functioning. Because functional status tends to decline through time, our comparisons are based on the relative declines between the two groups. Table 10 presents the baseline values and the difference (decline) by discharge or end of study. Baseline refers to enrollment in the demonstration. Average scores dropped between .01 and .28 points on individual items. There was only one significant difference across groups among the many analyses performed; among rollovers the control group showed less decline in dressing independence. The composite item, total number of dependencies, increased through time but did not differ significantly between the groups.

Table 10

COMPARISON OF FUNCTIONAL STATUS SCORES THROUGH TIME

	Rollovers				Admissions			
	Score at Baseline		Difference at Discharge		Score at Baseline		Difference at Discharge	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Ambulation (1–5)	3.36	3.16	−.20	-.17	3.41	3.38	−.20	−.12
Transferring (1–5)	3.15	3.05	−.17	−.16	3.16	3.14	−.15	−.13
Feeding (1–5)	4.00	4.03	−.22	−.22	4.22	4.33	−.28	−.17
Bladder (1–4)	2.96	2.96	−.14	−.18	3.06	3.10	−.10	−.11
Bowel (1–4)	3.19	3.17	−.16	−.16	3.36	3.30	−.16	−.10
Dressing (1–6)	3.14	2.95	−.21	−.13[b]	3.34	3.23	−.25	−.26
Level of consciousness (1–3)	2.98	2.98	−.02	−.02	2.99	2.99	−.01	−.01
Mental status (1–4)	2.48	2.54	−.14	−.14	2.63	2.71	−.16	−.20
Nondisruptive behavior (1–3)	2.66	2.70	−.01	−.02	2.71	2.69	−.12	−.08
Total number of dependencies (0–9)	3.49	3.63	+.36	+.37	3.23	3.23	+.36	+.39

NOTE: Numbers in parentheses represent range of functional status, higher scores indicate more independence.
[a] $P \leq .01$.
[b] $.01 < P \leq .05$.
[c] $.05 < P \leq .10$.

Potential effects on medication use were explored in several ways. Specific dose equivalents were calculated for five classes of common drugs used in nursing homes (psychotropics, sedatives, tricyclics, digoxin, and diuretics). Changes between baseline and discharge use of each were examined both overall and for subsets of relevant cases (e.g., hypertension, congestive failure, disruptive behavior). The results show a general lack of differences between the demonstration and control groups. Tables 11 and 12 show the daily dose equivalents at baseline and the difference at discharge for those receiving any of the studied types of drugs.

By contrast, there was a very evident difference in measures of medical attention, as shown in Table 13 The figures reported in the table are rates per patient day. For rollovers, both pre- and post-period values were available and are reported. For this group the statistical test compares the change in rates for the demonstration group with the change in rates for the controls. Because pre-period values do not exist for the new admission group (they were admitted to the nursing home at the start of their demonstration periods), that test compares demonstration period values between the two groups. Demonstration patients received more

Table 11

CHANGE IN DAILY EQUIVALENT DOSES FOR SELECTED MEDICATIONS FOR ROLLOVERS

	Number of Cases		Baseline		Difference at Discharge	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Psychotropics						
All subjects	110	130	5.15	3.92	− .36	−.00
Disruptive behavior	54	55	4.84	4.33	− .48	−.21
No disruptive behavior	54	73	5.43	3.64	− .27	+.15
Depressed	7	4	4.13	2.10	− .62	+.32
Sedatives						
All subjects	119	136	1.69	1.60	+ .12	+.08
Disruptive behavior	34	30	1.81	1.56	+ .07	−.01
No disruptive behavior	83	106	1.65	1.62	+ .08	+.10
Depressed	8	6	.99	2.89	+ .02	−.87
Tricyclics						
All subjects	38	57	5.51	4.30	+ .11	+.54
Disruptive behavior	4	5	3.74	5.93	− .11	+.07
No disruptive behavior	32	51	5.87	4.18	− .14	+.60
Depressed	5	2	6.50	4.00	−1.50	+.50
Digoxin						
All subjects	209	270	.154	.150	− .005	−.005
Congestive heart failure	112	230	.150	.142	− .006	−.005
Diuretics						
All subjects	72	74	1.87	1.62	− .00	−.05
Congestive heart failure	14	16	2.30	2.07	− .11	−.29
Hypertension	43	44	1.91	1.63	− .04	−.04
Congestive heart failure plus hypertension	7	6	2.31	1.62	− .21	−.00
Lasix						
All subjects	149	226	2.04	2.18	+ .12	−.00
Congestive heart failure	85	105	2.27	2.49	+ .19	−.05

Table 12

CHANGE IN DAILY EQUIVALENT DOSES FOR SELECTED MEDICATIONS FOR ADMISSIONS

	Number of Cases		Baseline		Difference at Discharge	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Psychotropics						
All subjects	40	22	3.87	4.07	− .08	− .27
Disruptive behavior	18	7	2.97	3.19	+1.33	−1.17
No disruptive behavior	22	15	4.62	4.48	−1.24	+ .15
Depressed	3	0	1.46	N.A.	+4.38	N.A.
Sedatives						
All subjects	42	39	1.05	1.36	+ .54	+ .58
Disruptive behavior	8	9	.94	1.40	+ .27	+1.22
No disruptive behavior	34	30	1.07	1.35	+ .61	+ .38
Depressed	2	3	1.25	.86	+ .02	+ .97
Tricyclics						
All subjects	7	14	4.69	3.33	− .99	+1.40
Disruptive behavior	0	2	N.A.	2.41	N.A.	+5.27
No disruptive behavior	7	12	4.69	3.49	− .99	+ .75
Depressed	1	0	2.50	N.A.	− .00	N.A.
Digoxin						
All subjects	82	67	.149	.150	− .002	+ .004
Congestive heart failure	44	38	.141	.144	− .006	+ .007
Diuretics						
All subjects	17	20	1.51	1.83	+ .07	+ .04
Congestive heart failure	0	4	N.A.	1.75	N.A.	− .00
Hypertension	11	11	1.53	1.94	+ .10	+ .01
Congestive heart failure plus hypertension	0	1	N.A.	2.00	N.A.	− .00
Lasix						
All subjects	52	41	2.03	2.40	+ .03	+ .17
Congestive heart failure	41	29	2.02	2.87	− .02	+ .20

written orders and fewer telephone orders. This indication of greater provider presence in the nursing home is confirmed by the data on numbers of visits. The general increase in total numbers of visits occurs as a direct substitution of NP/PA for physician. The number of visits by the former increase as expected, while those by the latter (including specialists) decrease. The only effect on the demand for services by other types of providers (e.g., physical therapists, occupational therapists, podiatrists, dentists) is an increase in the use of physical therapists by the rollovers.

Some of the most impressive quality differences were seen in the scores achieved on the tracers (Table 14). Demonstration patients had higher scores than controls on five of six tracers in the rollover group and six of seven tracers in the new admission group; differences were statistically significant for congestive heart failure, hypertension, and new cases of urinary incontinence.

One of our strongest a priori hypotheses was that NP/PAs could and would reduce hospitalizations. To control for patient deterioration through time, our statistical tests for the

Table 13

COMPARATIVE MEASURES OF MEDICAL ATTENTION
(Rates per patient day)

	Rollovers				New Admissions	
	Pre-period		Demonstration Period		Demonstration Period	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Medication orders						
Written	.0070	.0080	.0182	.0070[a]	.0344	.0158[a]
Telephone	.0246	.0248	.0184	.0216[b]	.0427	.0488
Lab tests and X-ray						
Written	.0048	.0050	.0149	.0043[a]	.0281	.0111[a]
Telephone	.0127	.0109	.0106	.0099	.0258	.0236
Nursing orders						
Written	.0038	.0040	.0138	.0037[a]	.0261	.0084[a]
Telephone	.0146	.0145	.0122	.0123	.0284	.0287
Special service orders						
Written	.0025	.0025	.0057	.0019[a]	.0161	.0054[a]
Telephone	.0114	.0117	.0084	.0118[a]	.0232	.0308[c]
Physician visits						
With exam	.0175	.0219	.0094	.0218[a]	.0128	.0342[a]
Without exam	.0094	.0073	.0043	.0079[a]	.0061	.0093[b]
NP/PA visits						
With exam	.0020	.0002	.0448	.0001[a]	.0561	.0000[a]
Without exam	.0003	.0000	.0057	.0000[a]	.0074	.0000[a]
Total visits						
With exam	.0195	.0221	.0541	.0219[a]	.0689	.0342[a]
Without exam	.0096	.0073	.0101	.0080	.0136	.0093[a]
Podiatry visits	.0118	.0116	.0113	.0111	.0123	.0117
Physical therapy	.0420	.0439	.0445	.0339[a]	.0631	.0506
Occupational therapy	.0053	.0058	.0055	.0037	.0132	.0190

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

rollover group compare changes in use between the demonstration and control patients. Control group rollovers experienced large increases in hospital admissions, inpatient days for emergent care, and consequently in total inpatient hospital days. Within the demonstration group, utilization rates did not change; therefore NP/PA patients averted an increase in hospital use. The difference between the NP/PA and control group patterns was statistically significant. For the new admission group, both admission and emergent hospital day rates were higher in the demonstration group than in the controls, but differences were not statistically significant. Rates are all calculated per patient study day and are shown in Table 15.

Table 14

COMPARISONS OF TRACER SCORES FOR ADMISSION AND ROLLOVERS[a]

	Number of Cases		Pre-period		Demonstration Period	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Rollovers						
Diabetes (−13.7 to +19.3)	160	176	2.19	1.63	2.75	2.16
Congestive heart failure (−18.4 to +17.9)	193	208	6.60	6.84	10.68	5.84[b]
Hypertension (−10.0 to +17.4)	274	286	6.00	5.50	6.18	5.03[c]
Chronic urinary incontinence (−7.0 to +11.1)	452	463	−.94	.43	−.77	.53
Feeding (0.0 to +11.0)	167	181	3.89	2.91	3.44	2.34
Fever (−2.0 to +20.6)	61	34	9.57	12.17	12.29	12.02
New Admissions						
Diabetes (−13.7 to +19.3)	59	63	—	—	3.58	2.19
Congestive heart failure (−18.4 to +17.9)	81	65	—	—	9.63	6.46[b]
Hypertension (−10.0 to +17.4)	98	82	—	—	6.88	5.55[c]
New urinary incontinence (0.0 to +6.7)	44	37	—	—	2.85	1.26[b]
Chronic urinary incontinence (−7.0 to +11.1)	42	107	—	—	1.30	1.21
Feeding (0.0 to +11.0)	78	48	—	—	3.45	2.93
Fever (−2.0 to +20.6)	63	20	—	—	13.13	13.34

[a]Possible range of scores in parentheses.
[b]$P \leq .01$.
[c]$.01 < P \leq .05$.
[d]$.05 < P \leq .10$.

The discharge outcomes are compared in Fig. 2. These results were analyzed in terms of both simple nonparametric tests and logistic regression. For the former, the pattern of discharges for the new admissions was statistically significantly different. When the outcomes were examined, controlling for variables that were significantly different between groups on admission to the study and those that were similarly significant in the earlier version of this approach with the Mountain States data (diagnoses of hip fracture, cancer, depression, stroke, and dementia; functional status expressed as numbers of dependencies; number of nursing therapies; age; sex; location before admission; and case mix), there were no differences in the probability of a live discharge or being hospitalized among those discharged alive. However, among new admissions discharged alive, significantly fewer demonstration patients returned to the community. The relative risk was 0.24, and the 95 percent confidence interval ranged from

Table 15

COMPARISONS OF HOSPITAL UTILIZATION PER PATIENT DAY FOR ADMISSIONS AND ROLLOVERS

	Rollovers				New Admissions	
	Pre-period		Demonstration Period		Demonstration Period	
	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients	Control Patients
Emergency room visits						
For tests	.0009	.0012	.0012	.0012	.0022	.0024
Not just for tests	.0020	.0021	.0032	.0040	.0049	.0057
Number of hospital admissions	.0017	.0015	.0018	.0024[c]	.0031	.0024
Hospital days						
Elective	.0011	.0008	.0012	.0008	.0009	.0008
Emergency	.0131	.0118	.0131	.0176[a]	.0223	.0189
Total	.0142	.0127	.0144	.0184[b]	.0233	.0197

[a] $P \leq .01$.
[b] $.01 < P \leq .05$.
[c] $.05 < P \leq .10$.

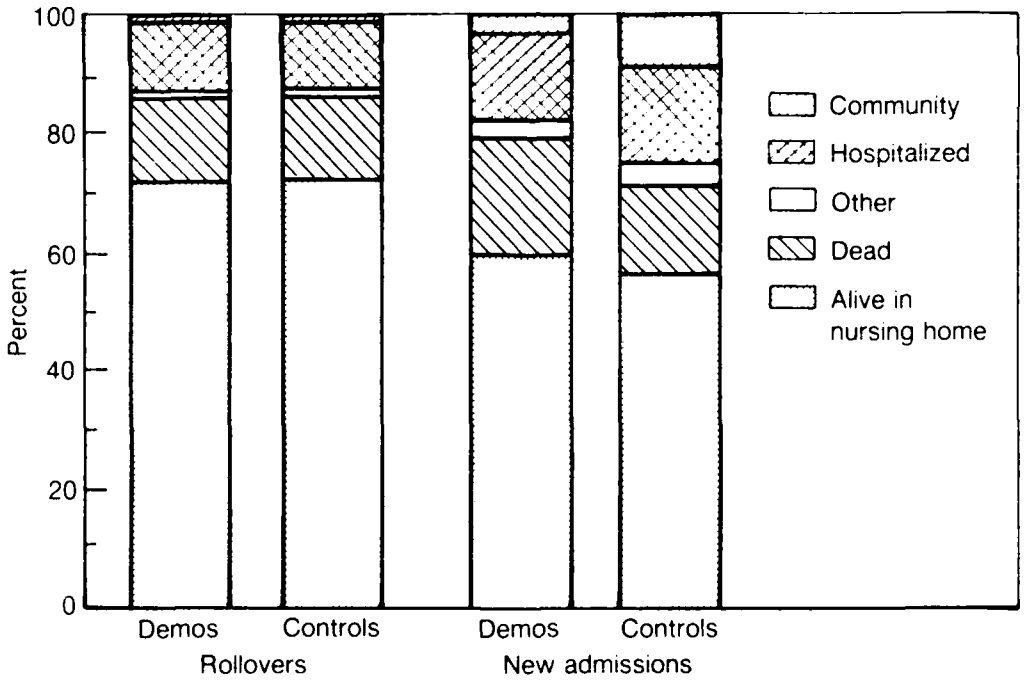


Fig. 2—Comparisons of discharge outcomes for rollovers and new admissions

0.09 to 0.62. The relative risk for demonstration new admissions who were discharged alive, but not to a hospital, of going to the community was 0.18 with a 95 percent confidence interval of 0.06 to 0.51.

The basic conclusion from this evaluation is that there was a modest improvement in care. The effects that were detected—increased medical attention, a relative reduction in hospitalization, and favorable tracer scores—generally benefited the demonstration participants.

IV. COST RESULTS

This section describes the cost analyses for the evaluation. Medicare and Medicaid claims are the primary data sources. For the multiple regression analyses, casemix measures are constructed from the nursing home medical record review data.

Because routine per diem nursing home costs constitute the largest burden on the Medicaid program for this population, our analysis is intended to determine the program effects on nursing home costs to the Medicaid program. All subsequent cost analyses exclude routine per diem nursing home costs.

The primary measure developed for the cost analyses was expenditures (charges) for medical services per study day. This measure included both Medicare and Medicaid services but took care not to double-count claims filed with both agencies. Since the claims data cover the period from 1984 through 1987, all figures were inflated to 1988 constant dollars. We look first at the distribution of expenditures per day for our two patient groups, rollovers and admissions. Multivariate models that control for patient casemix are then presented, followed by model predictions for a standardized sample.

Because hospitalization constitutes the largest component of costs and because we initially hypothesized that NP/PAs would lower costs by reducing unnecessary hospitalizations, we also developed multivariate models for hospital expenditures per study day. Both the models and predictions are presented separately for the two patient populations.

The section concludes with some descriptive data on Medicare and Medicaid reimbursements. Reimbursements differ from expenditures (charges) because: (1) both programs disallow services, (2) the two programs together do not always cover copayments, and (3) some providers charge more than either program will pay.

DESCRIPTIVE STATISTICS

Throughout this section we report the results of both unweighted and weighted analyses. In the unweighted analyses, long and short stays exert equal influence on means and regressions. In the weighted analyses, the number of study days, truncated at 366, is used for the weights, so that greater importance is given to patients with longer stays.[1] Unweighted analyses represent the sample of demonstration or control *patients*; weighted analyses represent the sample of demonstration or control *patient days* and consequently more closely approximate actual expenditures. However, because the unweighted analyses allow us to detect potentially important differences in short stay, higher cost patients, we have chosen to provide both the weighted and unweighted results.

Section II presented data from the sample matching work that showed how pre-period Medicare expenditures fell as time in the nursing home before enrollment increased. Figure 3 shows how this relationship continues to hold for post-enrollment expenditures. The vertical axis displays total expenditures per study day for medical services (excluding routine nursing home per diems) and the horizontal axis shows time in the nursing home as of enrollment.

[1]The study observation period was one year or through discharge, whichever came sooner. However, when the nursing home discharge resulted in a hospitalization, we followed patients through the post-hospitalization. As a result, the only patients observed for longer than one year were those with post-hospitalizations. To avoid giving undue emphasis to these high cost hospitalizations, we truncated the study days at 366.

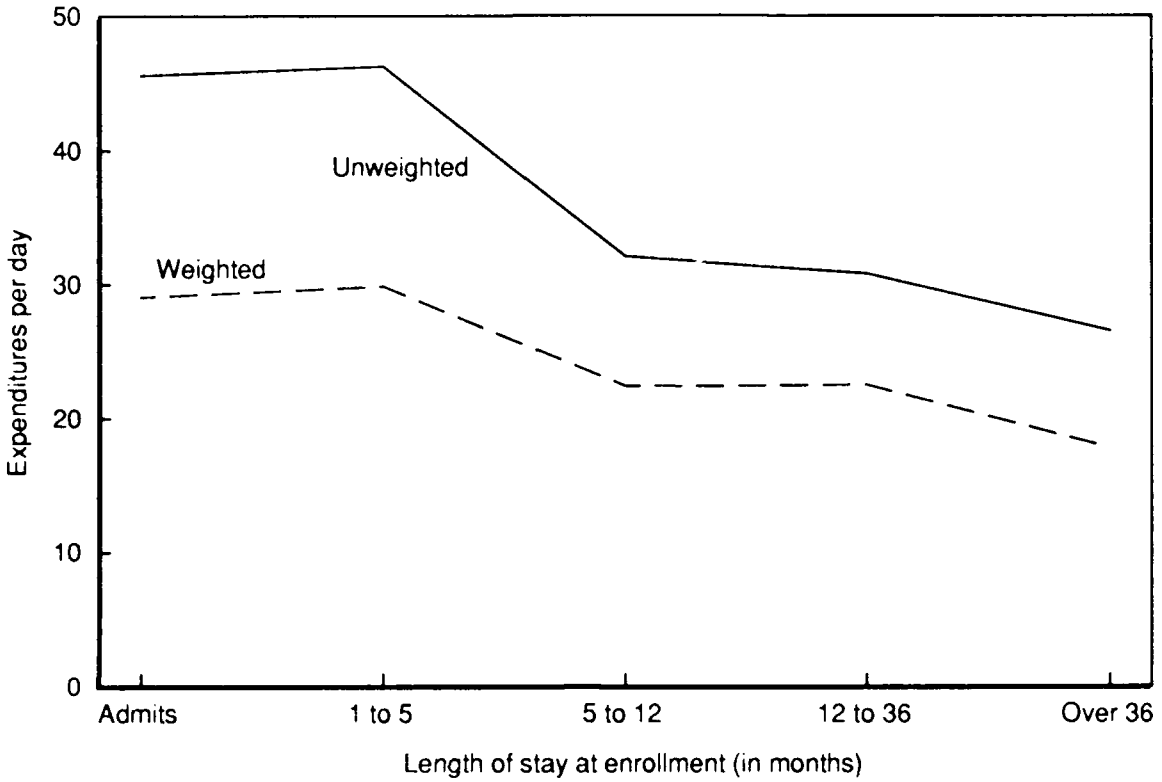


Fig. 3—Expenditures per day by length of stay at enrollment

Again, as the time in the nursing home lengthens, the average level of expenditures falls. The top curve shows this relationship when all patients are treated equally. In the lower curve each patient's average daily expenditures are weighted by his or her total time in the study; thus, each point more closely approximates average daily expenditures over the study period. This has the effect of reducing average daily expenditures within each previous length of stay grouping because longer staying, lower cost patients are given enhanced importance through the weights. Although the weighted curve has shifted downward, it displays essentially the same relationship between average daily expenditures and previous time in nursing home as the unweighted curve.

Figure 4 shows the level of average daily expenditures and the composition of services used for rollovers and admissions. Average daily expenditures for the new admission group, $45.61, are approximately 50 percent higher than those of the rollover group, $31.40, when patients are weighted equally. When each patient's average daily expenditures are weighted by days in the study, average daily expenditures for both groups fall by about one-third to $29.08 for admissions and $21.49 for rollovers. When patients are weighted equally, hospitalization accounts for about 60 percent of the total but drops to 55 percent and below when patients are weighted by their time in the study. The relative importance of pharmacy, other Medicare, and other Medicaid increases slightly in the weighted case relative to the unweighted comparison. These figures also show the relative contribution of the two payers. Medicare pays

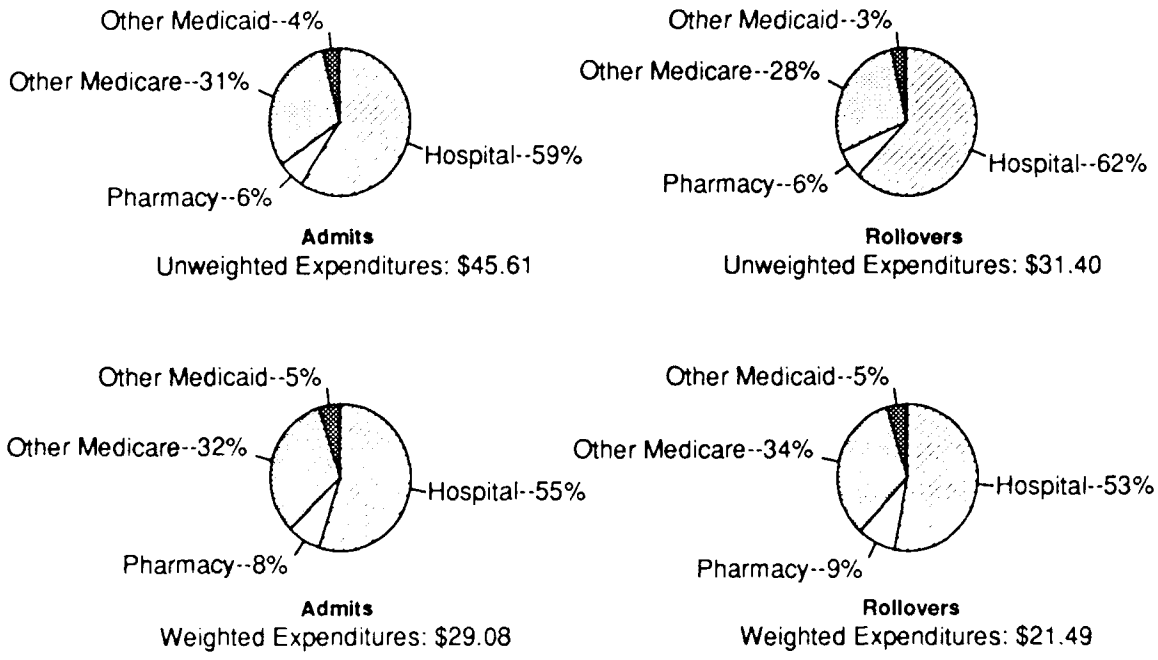


Fig. 4—Expenditures per day for admissions and rollovers

for most of the hospital costs and Medicaid for the pharmacy. Thus Medicaid accounts for approximately 10-15 percent of the total expenditures used and Medicare the remainder.

NURSING HOME COSTS

Our expectations regarding the effects of this program on nursing home costs were minimal. The hypothesis that patients treated by NP/PAs were more likely to be discharged to the community, if true, could lead to reduced nursing home costs. To explore this issue we compared both the number of nursing home days during the study period and the total study days (hospital plus nursing home days) between the demonstration and control patients.[2] These comparisons are shown separately for the rollovers and the new admissions in Table 16. The nursing home days among rollovers is very similar, 308 days for the controls and 307 days for the treatment group. For the new admissions the difference is larger, 260 days for controls and 272 days for the demonstration group. Neither difference is statistically significant. When hospital days are included, conclusions remain unchanged.

[2]Because Medicaid copayments are based on individual income and assets, comparisons of actual Medicaid expenditures for nursing home care between two groups of patients may differ because of wealth positions as well as patterns of use. A simple comparison based on time in nursing home eliminates this problem.

Table 16

NURSING HOME AND TOTAL DAYS BY ADMISSION AND STUDY GROUP

	Rollovers		Admissions	
	Control Patients		Demonstration Patients	
Nursing home days	308	307	260	272
Total study days	315	313	268	280

EXPENDITURES PER STUDY DAY

Our primary dependent variable, expenditures per study day, was created by combining information from the Medicare and Medicaid claims files. Expenditures for all services were included, whether or not reimbursement was made. Extensive efforts were made to preclude double counting of services that could be billed to both payers. We directed our attention on this measure both to ensure that all services were included and to obtain a more consistent valuation of services.

Figures 5 and 6 show the distributions of expenditures per study day for rollovers and admissions, respectively. The vertical axis represents the frequency of cases and the horizontal axis the dollar amount of expenditures per study day. The horizontal axis has been translated from the log scale so the increments are not equal.[3] The solid graphs represent the control patients and the dotted graphs the treatment group. For the rollover groups, Fig. 5, the demonstration patient distribution has shifted inward; that is, there are fewer patients at both the low and high end of the distribution. Another way to observe this inward shift is to note that the variance in the distribution of expenditures per day is smaller than the variance in the control group. This variance is smaller on both the raw and the log scales for both total expenditures per study day and total expenditures. All differences are statistically significant.[4]

In the new admission group, Fig. 6 similar shifts are not large enough to be statistically significant and the curves are much closer in shape.

Statistical Methods

Although our matching procedure provided samples with fairly similar pre-study properties, we used multivariate analyses to control for clinical measures of casemix and any residual differences not eliminated in the matching. As casemix measures, we have estimated models with alternative formal nursing home patient classification systems (Functionally Ranked Explanatory Designations (FRED), Resource Utilization Groups II (RUGs), and the Minnesota Casemix system), as well as with diagnoses and functional status measures. Table 17 contains

[3]Histograms on the logarithmic scale were smoothed using a discrete version of a kernel density estimator. Each initial histogram was formed with bin widths of .05 on the common logarithm scale. We reduced the variability of the estimated density at the center of each bin by computing a weighted average of histogram values, with weights decreasing for more distant bins. The weights were proportional to the density of a normal distribution with standard deviation of .01 (two bin widths). The weighted averages were connected with a cubic spline that passed through each point.

[4]In the upper tail of the distribution for rollovers, 20 of the top 25 cases occurred in the control group. To allow for the fact that we had looked at the data before constructing further tests on the upper tail, we conducted a simulation using a series of cutoffs. Our simulation results indicated that t-values in excess of 2.7 would ensure 5 percent real difference in our data. Actual values exceeded this figure.

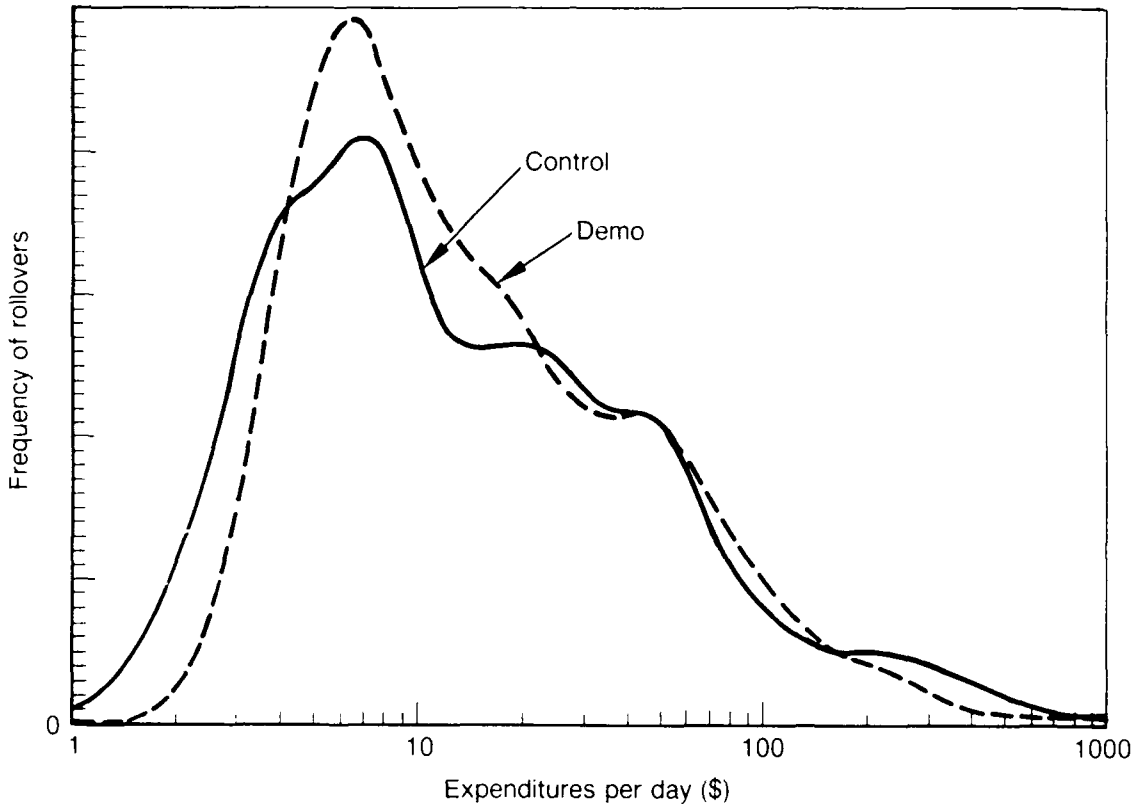


Fig. 5—Distribution of expenditures per day, rollovers

a list of variable definitions for the independent covariates used. Means and standard deviations by treatment and control group are shown in Table 18 for rollovers and in Table 19 for new admissions.

These data presented several modelling problems—extremely skewed errors, nonlinearity, and heterogeneity of the error variance—that are frequently encountered in analysis of health care expenditures (Duan et al., 1982). A frequently employed remedy for these problems is taking a log transformation of the dependent variable before applying ordinary linear regression. While analysts are now familiar with analyses conducted on a log scale, policymakers need to know the *dollar* implications of new programs, and this requires a retransformation of logged results back to the raw (dollar) scale. Estimated means on the raw scale depend on both means on the log scale and the distribution of errors on the log scale. If treatment affects the error distribution, it would invalidate the usual transformed analysis and seriously complicate statistical inference for any modification of that analysis. Because the treatment in this study apparently has affected the variance, retransformation assumptions would strongly influence the size of the treatment effect that we estimate.

To avoid this difficulty, we have used gamma regression, a form of generalized linear models, where the data are analyzed on the raw scale (McCullagh and Nelder, 1983). The key advantage of gamma regression is that it eliminates the need for retransformation because the

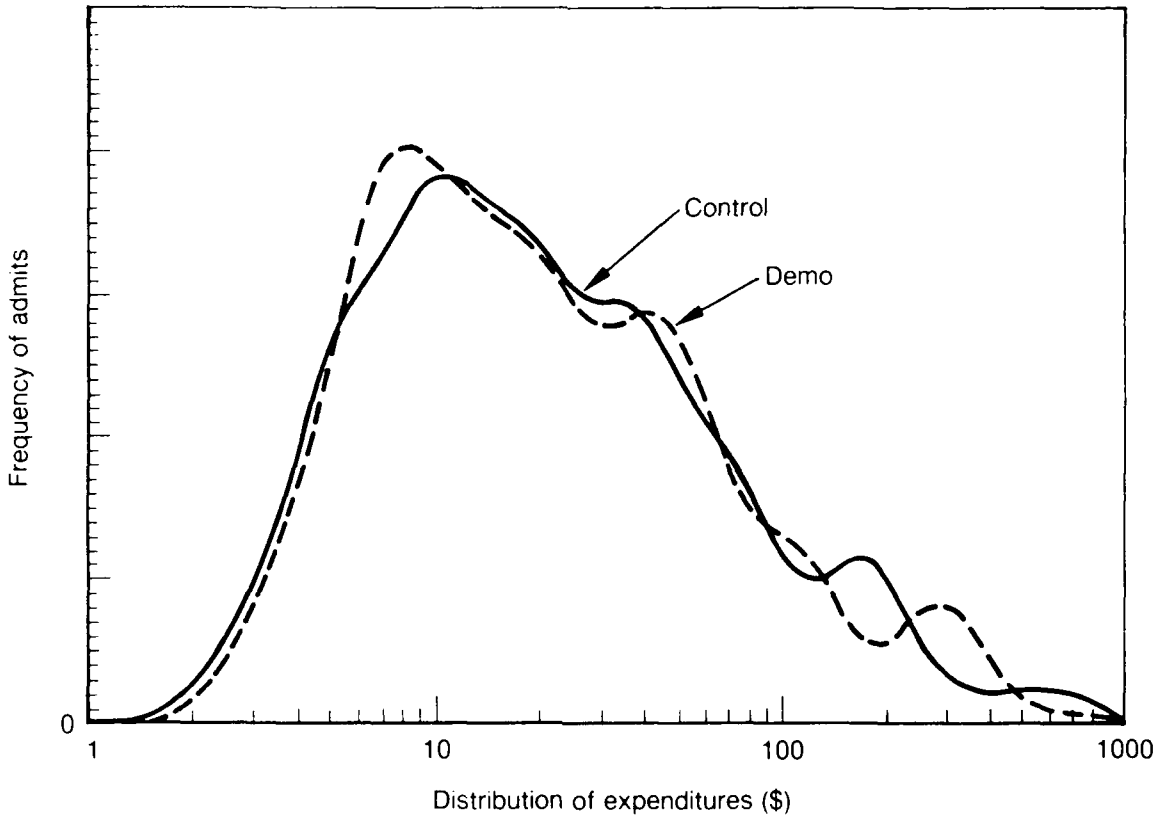


Fig. 6—Distribution of expenditures per day, admissions

model estimates means directly on the raw scale rather than indirectly, also avoiding the need for assumptions about equality of the error variances across treatment groups.

The gamma regression model shares two important assumptions with linear regression after a log transformation. First, both assume a multiplicative, rather than additive, model for the effect of independent variables on the outcome. For example, participation in the demonstration might be estimated to decrease expenditures by 10 percent, all others things being equal. In contrast, an additive model posits a constant dollar change. It seems more realistic to assume that NP/PAs might reduce costs by the same percentage amount for both high and low cost patients than to assume that they could alter costs for both by the same dollar amount. Second, both models assume that the standard deviation of the errors is proportional to the mean.

We contrasted our initial gamma regression models with results for the same models estimated using a log transformation and ordinary least squares regression. Coefficients and significance levels for variables other than the DEMO variable (signifying the treatment group) were quite similar. However the DEMO coefficients estimated from log models differed from those of the gamma regression models. We believe that the results from the log models were biased because they ignored the lower variance in the DEMO group and therefore required a

Table 17

DEFINITION OF VARIABLES

Variable Name	Definition
TCHPD	Total charges per day
DEMO	Indicator for demonstration patients
LGMRCHPD	Logarithm of pre-period Medicare charges per day
MALE	Indicator for male patients
AGELT75	Indicator for patients age 65 to 74 years old
AGE85PL	Indicator for patients over 85 years of age
EARLYENR	Indicator for patients enrolled during the first 6 months
LATEENR	Indicator for patients enrolled during the last 6 months
RURAL	Indicator for patients from rural nursing homes
PCTPPMD	Percentage of pre-period that patient was Medicaid eligible
NTHERAPY	Number of nursing therapies received at admission
BEHAVDEP	Indicator for patients who present behavior problems
MENTDEP	Indicator for patients who are mentally dependent
DEMENTIA	Indicator for patients with dementia
CANCER	Indicator for patients with cancer
CVA	Indicator for patients with cerebrovascular accident
HIP	Indicator for patients with hip fractures
LOWADL	Indicator for patients with 1-2 ADL dependencies
MEDADL	Indicator for patients with 3-4 ADL dependencies
Functionally Ranked Explanatory Designations	
FRED1	Minor dependency-1
FRED2	Minor dependency-2
FRED3	Intermediate dependency-1
FRED4	Intermediate dependency-2
FRED5	Complex dependency-1
FRED6	Complex dependency-2
FRED7	Complex dependency-3
FRED8	Behavior problem, minor dependency-1 to intermediate-1
FRED9	Behavior problem, intermediate depend-2 or complex depend-1
FRED10	Behavior problem, complex dependency-2,-3
Resource Utilization Groups II	
RUGS1	Special care, ADL index 5-7
RUGS2	Special care, ADL index 8-9
RUGS3	Heavy rehabilitation, ADL 3-4
RUGS4	Heavy rehabilitation, ADL 5-9
RUGS5	Clinically complex, ADL 3
RUGS6	Clinically complex, ADL 4-6
RUGS7	Clinically complex, ADL 7-8
RUGS8	Clinically complex, ADL 9
RUGS9	Behavioral problem, ADL 3
RUGS1011	Behavioral problem, ADL 4-9
RUGS12	Reduced physical functioning, ADL 3 (omitted group)
RUGS13	Reduced physical functioning, ADL 4
RUGS14-16	Reduced physical functioning, ADL 5-9
Minnesota Casemix System	
MINN1	Low ADL dependency (omitted group)
MINN2	Low ADL dependency, behavior problem
MINN3	Low ADL dependency, special nursing (includes behavior)
MINN4	Medium ADL dependency
MINN5	Medium ADL dependency, behavior problem
MINN6	Medium ADL dependency, special nursing (includes behavior)
MINN7	High ADL dependency
MINN8	High ADL dependency, behavior problem
MINN9	Very high ADL dependency or severe neurological impairment (two groups combined)
MINN10	High ADL dependency, special nursing (includes behavior, very high ADL dependency, and neurological impairment)

Table 18

VARIABLE MEANS AND STANDARD DEVIATIONS, ROLLOVERS

	Control Group		Demonstration Group	
	Mean	Standard Deviation	Mean	Standard Deviation
LGTCHGPD	2.59	1.26	2.66	1.09
LGMRCHPD	2.40	1.43	2.30	1.39
MALE	0.19	0.40	0.23	0.42
AGELT75	0.11	0.32	0.13	0.34
AGE85PL	0.54	0.50	0.50	0.50
EARLYENR	0.20	0.40	0.21	0.41
LATEENR	0.27	0.45	0.25	0.43
RURAL	0.05	0.23	0.01	0.10
NTHERAPY	2.52	1.98	3.15	2.26
BEHAVDEP	0.23	0.42	0.28	0.45
MENTDEP	0.44	0.50	0.46	0.50
DEMENTIA	0.32	0.46	0.35	0.48
CANCER	0.06	0.25	0.04	0.19
LOWADL	0.31	0.46	0.37	0.48
MEDADL	0.25	0.43	0.19	0.39
FRED1	0.06	0.23	0.08	0.27
FRED2	0.04	0.20	0.05	0.22
FRED4	0.02	0.14	0.02	0.14
FRED5	0.25	0.43	0.22	0.42
FRED6	0.10	0.30	0.10	0.30
FRED7	0.10	0.30	0.09	0.29
FRED8	0.02	0.14	0.02	0.15
FRED9	0.05	0.22	0.06	0.23
FRED10	0.08	0.27	0.08	0.28
RUGS1	0.03	0.16	0.01	0.11
RUGS2	0.01	0.10	0.02	0.13
RUGS3	0.03	0.17	0.02	0.13
RUGS4	0.05	0.22	0.06	0.24
RUGS5	0.03	0.17	0.02	0.15
RUGS6	0.08	0.28	0.07	0.25
RUGS7	0.02	0.13	0.01	0.12
RUGS9	0.04	0.20	0.05	0.22
RUGS1011	0.13	0.34	0.15	0.36
RUGS13	0.13	0.34	0.10	0.30
RUGS1415	0.26	0.44	0.24	0.43
MINN2	0.05	0.21	0.07	0.25
MINN3	0.01	0.12	0.02	0.14
MINN4	0.17	0.38	0.10	0.30
MINN5	0.05	0.21	0.05	0.22
MINN6	0.03	0.18	0.04	0.19
MINN7	0.03	0.18	0.02	0.16
MINN8	0.01	0.10	0.01	0.11
MINN9	0.26	0.44	0.25	0.43
MINN10	0.15	0.35	0.16	0.36

Table 19

VARIABLE MEANS AND STANDARD DEVIATIONS, ADMISSIONS

	Control Group		Demonstration Group	
	Mean	Standard Deviation	Mean	Standard Deviation
LGTCHGPD	3.02	1.19	3.04	1.17
LGMRCHPD	3.68	1.39	3.75	1.45
MALE	0.23	0.42	0.22	0.42
AGELT75	0.16	0.37	0.20	0.40
AGE85PL	0.46	0.50	0.35	0.48
EARLYENR	0.12	0.33	0.10	0.29
LATEENR	0.54	0.50	0.53	0.50
RURAL	0.06	0.24	0.00	0.00
PCTPPMD	0.61	0.42	0.68	0.41
NTHERAPY	2.43	1.76	3.10	2.07
BEHAVDEP	0.21	0.41	0.22	0.42
MENTDEP	0.34	0.47	0.38	0.49
DEMENTIA	0.26	0.44	0.27	0.45
CANCER	0.07	0.26	0.05	0.23
CVA	0.30	0.46	0.28	0.45
HIP	0.13	0.33	0.11	0.31
LOWADL	0.35	0.48	0.35	0.48
MEDADL	0.30	0.46	0.27	0.44
FRED1	0.09	0.29	0.07	0.26
FRED2	0.07	0.25	0.05	0.23
FRED4	0.03	0.16	0.03	0.16
FRED5	0.29	0.46	0.26	0.44
FRED6	0.07	0.25	0.12	0.32
FRED7	0.03	0.17	0.05	0.21
FRED8	0.04	0.19	0.02	0.13
FRED9	0.05	0.21	0.05	0.23
FRED10	0.06	0.23	0.04	0.19
RUGS1	0.02	0.13	0.01	0.10
RUGS2	0.00	0.07	0.01	0.10
RUGS3	0.02	0.15	0.04	0.20
RUGS4	0.05	0.21	0.05	0.22
RUGS5	0.04	0.19	0.01	0.10
RUGS6	0.16	0.37	0.13	0.34
RUGS7	0.01	0.11	0.02	0.13
RUGS9	0.04	0.20	0.04	0.20
RUGS1011	0.13	0.34	0.15	0.36
RUGS13	0.14	0.35	0.17	0.37
RUGS1415	0.19	0.39	0.20	0.40
MINN2	0.06	0.24	0.08	0.27
MINN3	0.03	0.17	0.03	0.17
MINN4	0.19	0.39	0.16	0.37
MINN5	0.05	0.21	0.06	0.24
MINN6	0.06	0.25	0.04	0.21
MINN7	0.02	0.15	0.03	0.17
MINN8	0.01	0.09	0.01	0.10
MINN9	0.15	0.36	0.13	0.34
MINN10	0.17	0.37	0.21	0.41

further step to yield accurate estimates of the DEMO effect. Because of this bias, we have chosen not to present those results.

In the work that follows we report the results of both weighted and unweighted analyses. The dependent variables are always expressed as expenditures per study day at risk. In the weighted analyses the number of study days, truncated at 366, are used for the weights. This set of weights gives greater importance to patients with longer stays and consequently more closely approximates actual expenditures. The unweighted analyses give each patient equal importance and hence allow us to detect potentially important differences in short stay, higher cost patients. Because it is important to observe effects of NP/PAs on subgroups of patients as well as on overall costs, we have opted to provide both the weighted and unweighted results.

Multivariate Models

We developed multiple models to represent alternative casemix formulations for nursing home patients. Tables 20 and 21, present the unweighted models for rollovers and admissions. Tables 22 and 23 display the weighted models for rollovers and admissions, respectively. In the most basic model, we control only for the pre-period daily Medicare expenditures (logged). The coefficient on the DEMO variable, which designates the treatment group, is negative but not significant in the unweighted model for rollovers and in both the weighted models.

The second model includes covariates for age, sex, and rural location. These variables are thought to affect expenditures and were used in the original patient matching process. Their inclusion should remove any residual effects not eliminated in the sample matching. Because early analyses of demonstration provider visit data showed that the time between provider visits lengthened as the demonstration matured, we hypothesized that expenditures, at least within the demonstration group, might vary by enrollment cohort. Thus, we have included a variable to indicate enrollment during the first and the last six months. The omitted category refers to the six months in the middle. These variables would also adjust for any overcorrection or undercorrection in our inflation procedures. While none were significant, at least one of the enrollment period variables had a t statistic greater than 1 in each of the models, so we retained them. Tests for interaction effects between the enrollment period variables and the DEMO variable were not significant, indicating that demonstration effects did not differ across the enrollment cohorts. Together, these variables contributed to the explanatory power of the models for new admissions, but added little to the models for rollovers.

Across all of the models, weighted and unweighted, expenditures for new admissions consistently dropped as age increased. Patients in the youngest age group, under 75 years of age, received more care than patients 75 to 84 (the omitted group), while patients 85 and older had the lowest daily use of services. The differences were not, however, statistically significant. No consistent pattern occurred in the rollover group. In all but two of the 24 models, males had higher costs than females, although again the differences were not significant.

In the unweighted models for new admissions, the rural coefficients generally had the expected negative sign. In the other models, however, the signs were positive, an unexpected result.

In the models for new admissions, we also included a variable, PCTPPMD, to indicate the proportion of the pre-period that the patient was eligible for Medicaid. Long time Medicaid eligibles would have a value of 1.0 for this variable, while patients who only recently spent down into Medicaid eligibility have values less than 1.0. The significant positive coefficients on this variable in the unweighted models suggest that lower income new admissions (those

Table 20

MULTIVARIATE MODELS OF EXPENDITURES PER STUDY DAY FOR ROLLOVERS
(Unweighted gamma models)

	Coefficient							
Variable	Minimal	Age, Sex Enrollment	Behavior	Diagnoses	ADLs	FRED	RUGs	Minnesota Casemix
INTERCEPT	2.820[a]	2.782[a]	2.910[a]	2.903[a]	2.978[a]	2.845[a]	2.567[a]	2.675[a]
DEMO	−0.127	−0.119	−0.143	−0.114	−0.126	−0.134	−0.076	−0.139
LGMRCHPD	0.263[a]	0.257[a]	0.250[a]	0.256[a]	0.249[a]	0.250[a]	0.240[a]	0.251[a]
MALE		0.134	0.129	0.127	0.154	0.151	0.144	0.110
AGELT75		0.006	−0.131	0.004	−0.031	−0.002	0.007	−0.014
AGE85PL		−0.023	−0.052	−0.048	−0.060	−0.028	0.000	−0.022
EARLYENR		0.099	0.112	−0.089	0.096	0.086	0.092	0.099
LATEENR		−0.000	0.002	−0.029	−0.015	−0.015	0.010	0.014
RURAL		0.200	0.194	0.182	0.180	0.123	0.173	0.186
NTHERAPY			−0.004	−0.015	−0.013	−0.003		
BEHAVDEP			0.117					
MENTDEP			−0.242[a]		−0.219[a]			
DEMENTIA				−0.189[c]				
CANCER				0.085				
LOWADL					−0.077			
MEDADL					0.033			
FRED1						0.116		
FRED2						−0.248		
FRED4						0.012		
FRED5						0.157		
FRED6						−0.121		
FRED7						−0.165		
FRED8						−0.001		
FRED9						−0.254		
FRED10						−0.353[c]		
RUGS1							0.589[c]	
RUGS2							0.165	
RUGS3							−0.121	
RUGS4							−0.356[c]	
RUGS5							0.611[a]	
RUGS6							0.587[a]	
RUGS7							−0.101	
RUGS9							0.568[a]	
RUGS1011							0.062	
RUGS13							0.357[a]	
RUGS1415							0.244[c]	
MINN2								0.496[a]
MINN2								0.496[a]
MINN3								0.662[c]
MINN4								0.217
MINN5								0.103
MINN6								0.373
MINN7								0.116
MINN8								−0.338
MINN9								−0.035
MINN10								0.271[c]
R^2	.032	.032	.038	.036	.038	.044	.048	.042
N	1973	1973	1973	1973	1973	1973	1973	1973

[a] P < .01.
[b] .01 < P < .05.
[c] .05 < P < .10.

Table 21

MULTIVARIATE MODELS OF EXPENDITURES PER STUDY DAY FOR ADMISSIONS
(Unweighted gamma models)

	Coefficient							
Variable	Minimal	Age, Sex Enrollment	Behavior	Diagnoses	ADLs	FRED	RUGs	Minnesota Casemix
INTERCEPT	2.621[a]	2.398[a]	2.536[a]	2.531[a]	2.754[a]	2.252[a]	2.310[a]	2.461[a]
DEMO	0.027	−0.042	−0.094	−0.102	−0.065	−0.132	−0.043	−0.157
LGMRCHPD	0.298[a]	0.290[a]	0.246[a]	0.265[a]	0.237[a]	0.276[a]	0.275[a]	0.257[a]
MALE		0.025	−0.019	−0.026	0.021	0.071	0.019	0.165
AGELT75		0.156	0.126	0.124	0.171	0.218	0.108	0.116
AGE85PL		−0.129	−0.163	−0.138	−0.138	−0.114	−0.150	−0.135
EARLYENR		0.002	−0.037	−0.063	−0.033	−0.090	−0.015	−0.065
LATEENR		0.093	0.108	0.051	0.126	0.132	0.079	0.155
RURAL		−0.121	−0.100	0.012	−0.063	−0.156	−0.128	−0.061
PCTPPMD		0.374[a]	0.356[a]	0.347[b]	0.351[a]	0.418[a]	0.417[a]	0.381[a]
NTHERAPY			0.066[c]	0.050	0.040	0.042		
BEHAVDEP			0.227					
MENTDEP			−0.446[a]		−0.403[a]			
DEMENTIA				−0.218				
CANCER				0.103				
CVA				0.019				
HIP				−0.406[c]				
LOWADL					−0.156			
MEDADL					−0.259			
FRED1						0.137		
FRED2						0.106		
FRED4						0.770[c]		
FRED5						0.117		
FRED6						0.133		
FRED7						−0.493		
FRED8						−1.071[a]		
FRED9						−0.054		
FRED10						0.144		
RUGS1							0.196	
RUGS2							0.801	
RUGS3							−0.358	
RUGS4							0.137	
RUGS5							0.782	
RUGS6							0.351	
RUGS7							−0.085	
RUGS9							0.045	
RUGS1011							0.211	
RUGS13							−0.065	
RUGS1415							0.159	
MINN2								−0.189
MINN3								0.656
MINN4								−0.409[c]
MINN5								0.238
MINN6								0.387
MINN7								0.632
MINN8								−0.404
MINN9								−0.140
MINN10								0.343
R^2	.059	.072	.086	.082	.084	.102	.095	.117
N =	526	526	526	526	526	526	526	526

[a] $P \leq .01$.
[b] $.01 < P \leq .05$.
[c] $.05 < P \leq .10$.

Table 22

MULTIVARIATE MODELS OF EXPENDITURES PER DAY FOR ROLLOVERS
(Weighted gamma models)

	Coefficient							
Variable	Minimal	Age, Sex Enrollment	Behavior	Diagnoses	ADLs	FRED	RUGs	Minnesota Casemix
INTERCEPT	2.546[a]	2.550[a]	2.645[a]	2.638[a]	2.710[a]	2.608[a]	2.364[a]	2.472[a]
DEMO	−0.048	−0.038	−0.058	−0.032	−0.038	−0.032	−0.001	−0.040
LGMRCHPD	0.218[a]	0.219[a]	0.206[a]	0.211[a]	0.203[a]	0.211[a]	0.207[a]	0.206[a]
MALE		0.053	0.039	0.050	0.063	0.083	0.045	0.043
AGELT75		0.052	0.018	0.050	0.017	0.039	0.049	0.031
AGE85PL		0.029	0.006	0.008	0.005	0.031	0.035	0.018
EARLYENR		−0.076	−0.069	−0.077	−0.078	−0.065	−0.079	−0.082
LATEENR		−0.128	−0.120	−0.144	−0.129	−0.136	−0.122	−0.119
RURAL		0.135	0.142	0.120	0.134	0.116	0.152	0.131
NTHERAPY			0.009	−0.001	−0.001	−0.002		
BEHAVDEP			0.147					
MENTDEP			−0.253[a]		−0.221[b]			
DEMENTIA				−0.211[b]				
CANCER				0.206				
LOWADL					−0.089			
MEDADL					0.077			
FRED1						−0.094		
FRED2						−0.226		
FRED4						−0.201		
FRED5						0.063		
FRED6						−0.148		
FRED7						−0.091		
FRED8						0.090		
FRED9						−0.130		
FRED10						−0.330[c]		
RUGS1							0.322	
RUGS2							0.506	
RUGS3							0.155	
RUGS4							−0.127	
RUGS5							0.442[c]	
RUGS6							0.491[a]	
RUGS7							−0.236	
RUGS9							0.476[b]	
RUGS1011							0.146	
RUGS13							0.303[b]	
RUGS1415							0.194	
MINN2								0.367[c]
MINN3								0.430
MINN4								0.216
MINN5								0.161
MINN6								0.428[c]
MINN7								0.077
MINN8								−0.092
MINN9								−0.054
MINN10								0.279[b]
R^2	0.028	0.028	0.032	0.033	0.032	0.034	0.038	0.036
N =	1973	1973	1973	1973	1973	1973	1973	1973

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

Table 23

MULTIVARIATE MODELS OF EXPENDITURES PER DAY FOR ADMISSIONS
(Weighted gamma models)

	Coefficient							
Variable	Minimal	Age, Sex Enrollment	Behavior	Diagnoses	ADLs	FRED	RUGs	Minnesota Casemix
INTERCEPT	2.539[a]	2.351[a]	2.401[a]	2.423[a]	2.465[a]	2.293[a]	2.303[a]	2.367[a]
DEMO	0.021	−0.026	−0.054	−0.046	−0.034	−0.081	−0.057	−0.078
LGMRCHPD	0.216[a]	0.211[a]	0.200[a]	0.195[a]	0.197[a]	0.212[a]	0.206[a]	0.200[a]
MALE		0.034	0.008	0.008	0.028	0.062	0.039	0.103
AGELT75		0.093	0.074	0.072	0.086	0.127	0.068	0.058
AGE85PL		−0.170	−0.201	−0.158	−0.184	−0.158	−0.196	−0.159
EARLYENR		0.002	−0.033	0.006	−0.032	−0.061	0.025	−0.018
LATEENR		0.181	0.169	0.195	0.180	0.212	0.187	0.204
RURAL		0.014	0.035	0.030	0.063	−0.032	0.014	−0.069
PCTPPMD		0.252	0.233	0.240	0.235	0.269	0.269	0.285[c]
NTHERAPY			0.031	0.019	0.022	0.019		
BEHAVDEP			0.167					
MENTDEP			−0.202		−0.153			
DEMENTIA				−0.225				
CANCER				−0.048				
CVA				0.089				
HIP				−0.123				
LOWADL					−0.044			
MEDADL					−0.085			
FRED1						0.030		
FRED2						−0.087		
FRED4						0.666		
FRED5						0.026		
FRED6						0.000		
FRED7						−0.341		
FRED8						−0.936[b]		
FRED9						−0.060		
FRED10						0.022		
RUGS1							−0.696	
RUGS2							0.340	
RUGS3							−0.096	
RUGS4							0.308	
RUGS5							0.174	
RUGS6							0.217	
RUGS7							0.404	
RUGS9							−0.086	
RUGS1011							0.159	
RUGS13							0.043	
RUGS1415							0.028	
MINN2								−0.198
MINN3								0.553
MINN4								−0.245
MINN5								0.243
MINN6								0.233
MINN7								−0.189
MINN8								−0.377
MINN9								−0.062
MINN10								0.219
R^2	0.035	0.046	0.050	.050	0.048	0.065	0.054	0.063
N =	526	526	526	526	526	526	526	526

[a] $P < .01$.
[b] $.01 < P < .05$.
[c] $.05 < P < .10$.

who are long term Medicaid eligibles) had higher expenditures than those who had only recently spent down into Medicaid eligibility.

Alternative Measures of Casemix

We adjusted for patient casemix using six alternative models, three based on formal nursing home patient classification systems and three using combinations of diagnoses, functional status, and use of nursing therapies at admission. The three formal systems and the adequacy of our data for coding these systems are discussed separately in App. B.

In one of the models, we included a limited set of commonly occurring diagnoses thought to affect costs. For the new admissions these were dementia, cancer, cerebrovascular accident, and hip fracture. For the rollover group, only dementia and cancer were included. For functional status, dependencies in six activities of daily living (ambulation, transferring, dressing, feeding, bowel control, and bladder control) were counted. Scores were rated as LOWADL if patients were dependent in 0–2 activities, MEDADL for 3–4 dependencies, and HGHADL for 5–6 dependencies. Indicators for patients with orientation problems, MENTDEP, and behavior problems, BEHAVDEP, were also included in some of the models. Finally, the variable NTHERAPY counts the number of special nursing therapies that the patient received at the beginning of the evaluation period.

Casemix Results

In models 3–5 we have added combinations of the functional status, diagnostic, and nursing therapy use measures to the models. Model 3 with the number of nursing therapies and indicators for orientation and behavior problems generally performs as well as or better than models 4 and 5. Model 4 uses the diagnostic categories in place of the indicators for mental and behavior problems; model 5 adds functional status and drops the behavioral dependency variable. For the new admission group, the number of nursing therapies has the expected positive sign and is marginally significant in the unweighted version of model 3. The coefficients for the rollover group are much smaller in size, close to zero, and vary in sign. Less is spent on patients with orientation problems, MENTDEP, in both the rollover and new admission groups, and the differences are usually quite significant both in the statistical sense and in absolute magnitude.

Models 6–8 incorporate the formal casemix systems, FRED, RUGs, and Minnesota casemix system, respectively. These models have the largest explained variance in each set. No one of these systems, however, consistently outperforms the other two.

The Effect of the Demonstration

In 30 of the 32 models the coefficient designating the treatment group is negative but not statistically significant. For the new admissions, the estimated effect ranges in size from +3 to −16 percent for the unweighted models and from +2 to −8 percent for the weighted models. For the rollovers, it ranges from −8 to −14 percent for the unweighted models and from close to zero to −6 percent in the weighted models. With the RUGs casemix system, the estimated size of the effect is consistently smaller than with FRED or the Minnesota system.

Tables 24 and 25 display for rollovers and admissions, respectively, the model predictions for a standardized sample consisting of all study patients. The first column of Table 24 displays the mean cost per day for all rollovers, both demonstrations and controls, that we

Table 24

PREDICTED EXPENDITURES PER STUDY DAY, ROLLOVERS
(1988 constant $)

Model	Unweighted			Weighted		
	Demonstration Patients	Control Patients	Difference	Demonstration Patients	Control Patients	Difference
1	$29.46	$33.44	-$3.98	$21.02	$22.06	-$1.04
2	29.54	33.28	- 3.74	21.13	21.96	- .83
3	29.25	33.76	- 4.51	20.91	22.15	- 1.24
4	29.67	33.25	- 3.58	21.21	21.90	- .69
5	29.52	33.48	- 3.96	21.12	21.95	- .83
6	29.38	33.60	- 4.22	21.22	21.91	- .69
7	30.14	32.52	- 2.38	21.53	21.56	- .03
8	29.38	33.77	- 4.39	21.13	21.98	- .85

Table 25

PREDICTED EXPENDITURES PER STUDY DAY, ADMISSIONS
(1988 constant $)

Model	Unweighted			Weighted		
	Demonstration Patients	Control Patients	Difference	Demonstration Patients	Control Patients	Difference
1	$46.30	$45.06	-$1.24	$29.42	$28.81	-$ .61
2	44.85	46.76	- 1.91	28.76	29.52	- .76
3	43.61	47.92	- 4.31	28.40	29.99	- 1.59
4	43.63	48.32	- 4.69	28.48	29.82	- 1.34
5	44.04	47.01	- 2.97	28.63	29.64	- 1.01
6	43.25	49.37	- 6.12	28.19	30.56	- 2.37
7	44.96	46.92	- 1.96	28.46	30.12	- 1.66
8	42.99	50.29	- 7.30	28.25	30.53	- 2.28

would have predicted *if each had participated in the demonstration.* The second column displays predicted means for the same patients, assuming that none had participated in the demonstration. Each predicted mean is based on the unweighted model corresponding to that row. The difference is an estimated treatment effect, averaged over all the study patients. Remember that the multiplicative model implies that the absolute treatment effect differs from patient to patient. The right side of the table differs in that predictions for each patient are based on the weighted gamma regressions, and the mean predictions shown on that side of the table are based on weighted means.

Estimated differences for rollovers suggest that the demonstration reduced expenditures by $2.38 to $4.51 per study day in unweighted analyses and $.03 to $1.24 from the weighted analyses. For the new admissions, the estimated effects ranged from +$1.24 to -$7.30 in the unweighted analyses and +$.61 to -$2.37 per study day from the weighted analyses. The confidence intervals on these estimates are large.[5] Using model 8 as an example, the 95 percent

[5]Confidence intervals for the DEMO coefficients in the regression (log scale) were used to compute confidence intervals for the average treatment effects. The former confidence intervals were symmetric around the estimates in Tables 20 to 23 (estimate plus or minus 1.96 standard errors). However, when the the endpoints for the former intervals were transformed to dollar amounts, the intervals lose their symmetry.

confidence interval around the estimated effect in the unweighted case of −$4.39 is −$9.40 to +$1.63 for rollovers; in the weighted case for the estimate, −$.85, is −$4.03 to +$2.89; for admissions in the unweighted analysis, the estimate, −$7.30, has a 95 percent confidence interval ranging from −$17.49 to +$6.04; for weighted analyses, the estimate drops to −$2.28 and the confidence interval to −$9.29 to +$7.05.

HOSPITALIZATIONS

Although the observed reduction in expenditures per study day was not statistically significant, it was large enough to warrant further analyses. Because we were particularly interested in the effects of the program on hospitalizations and hospital expenditures, we modeled these separately as shown in Table 26 for rollovers and Table 27 for new admissions. To limit the number of models, we selected only two from the original set, model 3 with casemix measures but no formal classification system, and model 8 with the Minnesota casemix. We selected model 3 because it dominated (in terms of explained variance) the other models without formal classification systems, and model 8 because no one system dominated and the Minnesota casemix system was used in the quality of care component of the evaluation.

Table 26

GAMMA MODELS PREDICTING HOSPITAL EXPENDITURES PER DAY, ROLLOVERS

	Coefficient			
	Unweighted		Weighted	
Variable	Behavior	Minnesota Casemix	Behavior	Minnesota Casemix
INTERCEPT	2.506[a]	2.096[a]	2.056[a]	1.728[a]
DEMO	−0.282[b]	−0.277[b]	−0.189	−0.172
LGMRCHPD	0.268[a]	0.274[a]	0.220[a]	0.224[a]
MALE	0.143	0.114	0.021	0.029
AGELT75	−0.111	−0.075	−0.107	−0.070
AGE85PL	−0.036	0.027	0.066	0.096
EARLYENR	0.131	0.105	−0.076	−0.117
LATEENR	−0.011	0.015	−0.199	−0.199
RURAL	0.108	0.113	0.059	0.077
NTHERAPY	−0.029		−0.007	
BEHAVDEP	0.190		0.239	
MENTDEP	−0.273[c]		−0.222	
MINN2		0.770[b]		0.694[b]
MINN3		0.829		0.538
MINN4		0.321		0.365[c]
MINN5		0.205		0.344
MINN6		0.370		0.412
MINN7		0.187		0.272
MINN8		−0.319		0.090
MINN9		0.069		0.120
MINN10		0.329		0.436[b]
R^2	0.024	0.027	0.015	0.019
N =	1973	1973	1973	1973

[a] P < .01.
[b] .01 < P < .05.
[c] .05 < P < .10.

Table 27

GAMMA MODELS PREDICTING HOSPITAL EXPENDITURES PER DAY, ADMISSIONS

	Coefficient			
	Unweighted		Weighted	
Variable	Behavior	Minnesota Casemix	Behavior	Minnesota Casemix
INTERCEPT	1.928[a]	1.711[a]	1.647[a]	1.506[a]
DEMO	−0.146	−0.275	−0.178	−0.251
LGMRCHPD	0.254[a]	0.267[a]	0.230[a]	0.228[a]
MALE	−0.057	0.303	0.043	0.240
AGELT75	0.109	0.056	0.052	0.006
AGE85PL	−0.256	−0.236	−0.270	−0.197
EARLYENR	0.010	0.013	−0.004	0.022
LATEENR	0.125	0.249	0.262	0.347
RURAL	−0.045	0.184	−0.026	−0.128
PCTPPMD	0.466[c]	0.600[b]	0.316	0.429
NTHERAPY	0.071		0.021	
BEHAVDEP	0.413		0.351	
MENTDEP	−0.526[b]		−0.208	
MINN2		−0.276		−0.270
MINN3		0.799		0.754
MINN4		−0.612[b]		−0.320
MINN5		0.430		0.534
MINN6		0.602		0.434
MINN7		0.889		−0.186
MINN8		−0.283		−0.211
MINN9		−0.070		−0.009
MINN10		0.468		0.370
R^2	0.053	0.089	0.031	0.045
N =	526	526	526	526

[a] $P \leq .01$.
[b] $.01 < P \leq .05$.
[c] $.05 < P \leq .10$.

In the unweighted analyses for rollovers, the estimated demonstration effect was a reduction in hospital expenditures of approximately 28 percent, a statistically significant difference. When the observations are weighted by the number of study days to better approximate total expenditures for the program, the difference drops to 17 to 19 percent and loses statistical significance. The lack of statistical significance in the weighted model suggests that the demonstration had a bigger effect on high cost, short staying patients than on longer staying patients.

For the new admissions group, the coefficients on the treatment group variable are again negative but not statistically significant. They range in size from −15 to −28 percent.

Table 28 displays model predictions for the treatment and control groups. For rollovers in the unweighted analysis, the differences fell between −$5.40 and −$5.50; in the weighted analysis, the differences fell between −$1.90 and −$2.20. For the new admission group, in the unweighted analysis, the difference was −$4.01 in the first model and −$7.92 in the second; for weighted analyses, the differences ranged between −$2.90 and −$4.20.

Table 28

PREDICTED HOSPITAL EXPENDITURES PER STUDY DAY

Model	Unweighted			Weighted		
	Demonstration Patients	Control Patients	Difference	Demonstration Patients	Control Patients	Difference
Rollovers						
Model 3	$16.79	$22.27	-$5.48[a]	$10.34	$12.48	-$2.14
Model 8	16.93	22.34	- 5.41[a]	10.49	12.45	- 1.96
Admissions						
Model 3	$25.45	$29.46	-$4.01	$14.84	$17.74	-$2.92
Model 8	$24.99	$32.91	- 7.92	14.65	18.82	- 4.17

[a]Statistically significant at 5 percent level.

The Role of the Discharge Hospitalization

All expenditures analyses reported above include the final hospitalization expenditures for patients who leave the study because they are discharged to the hospital and do not return to their original nursing home or do not return within 30 days. Including the discharge hospitalization does not affect our conclusions about the effects of the demonstration. Table 29 presents basic data that allow us to better understand the implications of including these expenditures in the analyses. Unlike most of the data that we have presented, the data in this table are not adjusted for the length of the study period. This primarily affects the demonstration patients in the new admission group who, on average, stayed 12 days longer than their control counterparts. As a result, some of the per-case measures appear somewhat larger than the corresponding measures in the control group, although the differences are never statistically significant.

The number of discharge hospitalizations in the rollover group is somewhat smaller for demonstration patients, and the difference occurs only in the demonstration period. For both demonstration patients and controls in the rollover group, about 12 percent have discharge hospitalizations; for the new admission group the differences again occur in the demonstration period with little difference in the rates of discharge hospitalization. For inpatient days the patterns are similar between the demonstration and discharge periods although they differ in direction between the treatment and control groups.

In terms of expenditures per case in the rollovers, expenditures in the treatment group were lower than in the control group for both the demonstration and the discharge periods by approximately the same percentage. For the new admissions, expenditures in the discharge period were lower for the treatment group than for the controls. This difference was larger in percentage terms than in the demonstration period. We believe that including the discharge hospitalization did not affect the conclusions about the demonstration effects.

MEDICARE AND MEDICAID REIMBURSEMENTS

Tables 30 and 31 show average Medicare and Medicaid reimbursements per study day, respectively. The combined reimbursements fall well below the level of total expenditures. Reimbursements differ from expenditures because some services are not reimbursed,

Table 29

HOSPITALIZATION DATA
(Unadjusted and unweighted; 1988 constant $)

	Rollovers		Admissions	
	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients
Per case figures				
No. of hospitalizations	.59	.53	.60	.66
Demo period	.48	.42[c]	.44	.51
Discharge	.12	.12	.16	.14
Inpatient hospital days	6.82	5.80	7.42	8.26
Demo period	3.83	3.33	3.53	3.99
Discharge	2.99	2.47	3.89	4.27
Total charges	$3953	$3280[c]	$4499	$4369
Demo period	$2462	$2028[b]	$2514	$2485
Discharge	$1490	$1253	$1985	$1884

[a] $P \leq .01$.
[b] $.01 < P \leq .05$.
[c] $.05 < P \leq .10$.

copayments are not covered in full, and reimbursement rates are usually quite a bit less than charges. Reimbursements by program are of interest because they represent the actual government outlays for the program. The relative importance of different components informs policymakers regarding how federal dollars are being spent and identifies areas of greatest importance for cost containment efforts.

The differences between the treatment and control groups for reimbursements are much smaller than those for total expenditures. The Medicare program bears the largest share of the costs, approximately four times the amount borne by the Medicaid program, and hospitalization accounts for the largest part of Medicare outlays for this group. Within the Medicaid program, Medicare copayments and pharmacy contribute the largest costs.

Table 30

PER DIEM MEDICARE REIMBURSEMENTS
(Unadjusted and unweighted; 1988 constant $)

	Rollovers		Admissions	
	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients
Hospital	$13.95	$11.51	$18.38	$18.18
Non-hospital	$ 6.89	$ 7.14	$10.42	$11.10
Per diem total Medicare reimbursements	$20.84	$18.66	$28.80	$29.28
Per diem total expenditures	$34.26	$28.39	$45.64	$45.59

Table 31

PER DIEM MEDICAID REIMBURSEMENTS
(Unadjusted and unweighted; 1988 constant $)

	Rollovers		Admissions	
	Control Patients	Demonstration Patients	Control Patients	Demonstration Patients
Pharmacy	$1.67	$1.87	$2.55	$2.45
Dental	.07	.09	.08	.10
Transportation	.16	.19	.28	.24
Medical services	.39	.27	.67	.56
Practitioner/OPD/other	.05	.14	.20	.17
Copayments	1.69	1.86	3.50	3.76
Per diem totals	$4.03	$4.42	$7.28	$7.28

SUMMARY

In our analysis of expenditures per study day (excluding nursing home services) we found that the demonstration significantly reduced the variation in expenditures per study day for the rollover group. That is, the demonstration produced substantially fewer very low cost patients and substantially fewer very high cost patients. The reduction in the high cost patients is a positive and important finding. These results also suggest that additional efforts to better target the patients at highest risk may make the program more cost effective. Multivariate analyses comparing the demonstration and control groups indicated that while the demonstration patients consistently had somewhat lower total expenditures per study day, these differences were never statistically significant.

Further analysis indicated that lower hospital expenditures for demonstration patients constituted most of the differences mentioned above. The difference in hospital expenditures per study day was statistically significant for rollovers when all patients were weighted equally. However, the greatest differences in hospital expenditures per study day occurred for those rollovers who had relatively short stays within the study period. When hospital expenditures per study day were weighted by the number of study days, the difference was no longer statistically significant. Thus, the reductions for those who appeared to be most affected were not large enough for us to conclude that the demonstration significantly lowered total hospital expenditures.

With respect to the overall costs of the program, the demonstration shows clear, positive signs of movement in a cost effective direction, both by reducing the variation in expenditures per study day and by reductions in hospital expenditures per study day for rollovers. However, at the present time, we must conclude that the program is cost neutral, as the movements are neither large enough nor extensive enough to achieve statistical significance for the entire program.

V. SATISFACTION RESULTS

As a final dimension to the program evaluation we surveyed the individuals directly responsible for patient care in the nursing home, the administrators and the directors of nursing service, to determine their impressions of the program and level of satisfaction with it. This component of the evaluation focused attention on the effect the demonstration model had on the clinical service in general. The study also attempted to explore the acceptability of a new program to patients and families.

We hypothesized that both directors of nursing and administrators would perceive that the demonstration model, combined with its more flexible reimbursement system and the loosening of reimbursement restrictions on visit frequency, provided "better" medical care to their patients. In addition, we hypothesized that it would have a positive effect on the clinical services and be acceptable to patients and families.

This survey of administrators and directors of nursing was also intended to be a comparative assessment of the issues at the operational level from a qualitative perspective. To this end, each structured question was followed by a request for a short explanatory narrative response.

THE SAMPLE

We surveyed the administrators and directors of nursing in 71[1] nursing homes with demonstration patients. In these homes, both the demonstration and the traditional (physician only) models of care were being delivered concurrently and thereby could offer a means of comparison. Questionnaires were sent to both the administrator and the directors of nursing services (DNS) at each facility.

Of the original 71 demonstration homes surveyed, 67 responded. A total of 115 (85.8 percent) of the eligible 135 individuals (administrators or DNS) returned a completed questionnaire—55 (82 percent) administrators, 60 (89.6 percent) DNS. Demographics of the respondent group are presented in Table 32.

QUESTIONNAIRE CONTENT

Questions to evaluate the effect on medical care asked: (1) if there had been any variation between the demonstration and the traditional model in the number of visits by medical caregivers; (2) if there was a noticeable difference in the length of time the home had to wait for a medical response (returned phone calls and/or physical presence) between the models; (3) if there was improved monitoring of medications, nursing/physician orders, and care plans; (4) if medical charts were reviewed and orders signed in a timely fashion (compliance); and (5) if there was any improvement in the overall physical functioning of the residents from the frequent and "timely" visits by the NP/PAs.

[1]Four homes were unable to participate in this phase of research. One home had closed since the initiation of the study, and in the remaining three either the demonstration model was discontinued after too brief a period for proper assessment of the care delivered, or the home had recently experienced a complete turnover in administration.

Table 32

DEMOGRAPHICS OF THE RESPONDENT GROUP
(Percentages in parentheses)

Characteristic	Administrators	DNS
Male	33 (60)	4 (6.7)
Female	22 (40)	56 (93.3)
Licensed 1-15 yrs	40 (72.7)	18 (30)
Licensed 16+ yrs	10 (18.2)	38 (63.3)
Length of time licensed not given	5 (9.1)	4 (6.6)
Size of home		
1-75 beds	13 (23.6)	14 (23.3)
76-150 beds	29 (52.7)	32 (53.3)
150+ beds	13 (23.6)	14 (23.3)

Questions on satisfaction with the demonstration program were divided into three subgroups. First, what effect did the NP/PA have on the nursing staffs' practices and morale? Second, was there noticeable resident awareness of the NP/PA, and if so, how satisfied were they with the care received? Third, was there any feedback to the administrator or DNS indicating family satisfaction with the demonstration model?

Because the demonstration model augmented the medical presence within the nursing home, we asked whether nursing homes changed their admitting practices to include sicker patients than had previously been the policy.

In a summary question, respondents were asked whether they believed the demonstration model offered a stronger model for future nursing home care.

RESULTS AND DISCUSSION

Although the majority of respondents answered the questions positively, specific themes emerged from the narrative comments that helped define and substantiate these responses.

Quality of Medical Care

Clearly the respondents believed that the demonstration model offered more medical care. Of the 115 survey respondents, 92.2 percent believed that the NP/PA delivered more medical care to the residents. Only 7.8 percent believed that the amount of care delivered was about the same as that received with the traditional model. Not a single respondent reported that less care was offered. See Fig. 7.

There were two sub-themes within the concept of "more care." First, "more care" was considered to be an outcome of the change in the pattern of service delivery. There were noticeable differences in accessibility/availability (whether physical or by phone) and increased frequency of actual visits to the patients. This change resulted in a perceived improvement in responsiveness to staff requests to come and give personal attention. Overall, the NP/PA model was believed to provide more professional availability than most physician only practices. In part these observations could be attributable to the change in reimbursement. However, "more care" was also seen to be the result of a change of the caregiver—NP/PA rather than MD. Respondents reported that not only were the NP/PAs more available, they (1) were more attentive to the individual resident care needs; (2) spent more time with their residents,

1. In your opinion, patients in the MD/NP/PA practice model received (1) More, (2) About the same, or (3) Less medical attention (visit by either or both practitioners) than patients cared for in the traditional manner (MD) only)?

	Percent	Total	ADM/DNS
More	92.2	106	51 / 55
About the same	7.8	9	4 / 5
Less	0.0	0	0 / 0

2. In your opinion, the response to an expressed need for medical care was: (1) Faster, (2) About the same, or (3) Slower for patients in the MD/NP/PA practice than those seen by physicians only?

	Percent	Total	ADM/DNS
Faster	81.7	94	42 / 52
About the same	18.3	21	13 / 8
Less	0.0	0	0 / 0

3. In your opinion, medical orders were (1) More, (2) Equally, or (3) Less likely to be signed on time for the demonstration patients (MD/NP/PA) than were orders for the traditional (MD only) patients?

	Percent	Total	ADM/DNS
More	76.5	88	40 / 48
About the same	22.6	26	14 / 12
Less	0.0	0	0 / 0

4. In your opinion, drug orders and other medical interventions of MD/NP/PA patients were (1) More, (2) Equally, or (3) Less well monitored than for traditionally treated patients?

	Percent	Total	ADM/DNS
More	67.8	78	36 / 42
Equally	31.3	36	19 / 17
Less	0.0	0	0 / 0

5. In your opinion, did the care provided by the MD/NP/PA model impact (1) Positively, (2) About the same, or (3) Negatively on the overall physical, cognitive and psychological functioning of your residents?

	Percent	Total	ADM/DNS
Positively	73.0	84	38 / 46
About the same	25.2	29	16 / 13
Negatively	0.0	0	0 / 0

Fig. 7—Questionnaire and responses

6. In your opinion, the presence of the nurse practitioner or physician's assistant in your home had a (1) Positive impact, (2) No particular impact, or (3) Negative Impact on your nursing staff and nursing practices?

	Percent	Total	ADM/DNS
Positive impact	91.4	105	51 / 54
No particular impact	4.3	5	2 / 3
Negative impact	4.3	5	2 / 3

7. In your opinion, the presence of the nurse practitioner or physician's assistant in your home had a (1) Positive impact, (2) No particular impact, or (3) Negative impact on your nursing staff's morale?

	Percent	Total	ADM/DNS
Positive impact	80.0	92	45 / 47
No particular impact	14.8	17	17 / 10
Negative impact	3.5	4	2 / 2

8. In your opinion, the presence of the MD/NP/PA practice model in your facility (1) Increased, (2) Had no effect on, or (3) Decreased the acuity of your admitting case mix?

	Percent	Total	ADM/DNS
Increased	17.4	20	10 / 10
Had no effect on	77.4	89	43 / 46
Decreased	0.0	0	0 / 0

9. Has the presence of the MD/NP/PA practice model in your facility altered your admitting practice in any way: (1) Yes, or (2) No?

	Percent	Total	ADM/DNS
Yes	13.0	15	6 / 9
No	80.9	93	47 / 46

10. From your administrative perspective and based on your experience with this project, if the patient case mix in nursing homes continues to become more acute do you feel that the care provided by the MD/NP/PA practice model (as you experienced it) offers a (1) Stronger, (2) About the same, or (3) Weaker model to utilize in the future as compared to the traditional (MD only) practice?

	Percent	Total	ADM/DNS
Stronger	92.2	106	51 / 55
About the same	5.2	6	3 / 3
Weaker	0.0	0	0 / 0

Fig. 7—continued

and therefore knew them better as individuals; and (3) offered greater availability and accessibility to the nursing home staff members.

Respondents also reported that the NP/PAs were more quickly available to an expressed need for care for residents in the demonstration than for those in the traditional model: 94 (81.7 percent) reported that the response rate was faster, and only 21 (18.3 percent) reported that it was about the same. No one reported that the response rate was slower.

Similar sub-themes emerged associating faster response to the changes in the service delivery pattern and caregiver. Administrators and DNS alike noted that the demonstration providers were both more available to respond when necessary and more available to come into the facility to see the resident instead of sending the resident to the emergency room or giving medical orders over the phone. The NP/PA was more accessible (easier to reach or get in touch with) to the nursing home staff and returned their phone calls more quickly.

A third aspect of quality of medical care is compliance with medical related regulations and how well drug and other medical orders are monitored. Eighty-eight (76.5 percent) respondents believed that the medical orders were more likely to be signed on time under the demonstration model, while 26 (22.6 percent) felt that regulation compliance was about the same as that experienced with the traditional model.

Those who responded that the NP/PA presence affected compliance positively noted that the NP/PAs were in the facility far more frequently, were more conscientious of being timely, and took care to remind their physicians to be available to co-sign the orders when necessary.

Seventy-eight (67 percent) respondents reported that drug orders and other medical interventions were better monitored with NP/PA presence in the facility. Another 36 (31.3 percent) believed that there was no difference in the effect on monitoring between the two models.

Those who responded that the monitoring was improved noted that because the NP/PA was in the facility more frequently, charts and records were reviewed more often. Others commented that because the NP/PA knew their residents as individuals, the NP/PA was better able to monitor the resident's conditions. For both questions, those respondents reporting that there was no discernible difference between the two models stated that their facility's staff and physicians already reviewed and signed according to state regulations.

Finally, in terms of quality of care we were interested in the perception of administrators and DNSs regarding the effect of care received on the resident's overall functioning (physical, cognitive, and psychological). Eighty-four respondents (73 percent) reported a positive effect.

The narrative responses primarily identified the demonstration's faster provider response as a reason for their positive perspective. They wrote that the residents had benefited greatly from the increased frequency and timeliness of visits by the NP/PA. The NP/PA had a greater familiarity with each resident and could therefore offer a quicker response to any change in the resident's condition. The NP/PA was seen as being more concerned with overall functioning and not just with ordinary medication and laboratory tests. There was true attempt to restore and maintain the residents at their highest level of function. Numerous individuals commented that the residents obviously appreciated being given the opportunity to express their needs and as a result were less anxious about their care. The responses, without directly stating it, illustrated the integration of nursing and medical roles.

Those administrators and DNSs who reported that the effect was about the same noted that the functioning of a resident varied with their general condition, and awareness by residents of the program had not been noticeable.

Effect on Staff Practices and Morale

The administrators and DNSs were also asked to respond to questions addressing areas of staff practices and morale. Of our 115 respondents, 91.4 percent reported that the presence of the NP/PA had a positive effect on their nursing staff and nursing practices.

Sub-themes emerged identifying the positive effect as a result of either effective or instrumental communication. Effective communication was defined by the respondents as the NP/PA's ability to carry out interactive resident care/problem discussions with the nursing staff, maintain good rapport with nursing staff, and, as a result, develop a more comfortable working relationship. The NP/PA was also found to be very effective as an instrumental communicator, acting both as a clinical resource/re-teaching source for nursing staff and a role model for staff members.

The remaining 10 respondents reported that the NP/PA had either no particular effect (4.3 percent) or a negative one (4.3 percent) on their nursing staff and nursing practices. The five individuals reporting that the NP/PA had negatively affected the nursing staff indicated in the narrative that it was the personal style of the NP/PA and the timing of visits, not the clinical skills, that had created the negative effect.

The question addressing the effect of the NP/PA on nursing staff morale received similar responses. Ninety-two (80 percent) of the respondents reported the effect as positive. When the nursing staff witnessed improved care delivery, and believed that their effort was valued by the team, nursing staff morale was enhanced. Seventeen (14.8 percent) reported that the presence of the NP/PA had no particular effect on nursing staff morale, while four respondents (3.5 percent) reported that their presence had resulted in a negative effect. (Two individuals did not respond to this question.) As before the negative effect reflected personality conflicts and the timing of visits, not actual care delivery.

Patient and Family Satisfaction

Answers to our survey question regarding family and resident satisfaction were provided by the administrator and the DNS of each facility, not directly by residents or family members. Resident satisfaction was almost evenly split between more satisfied (47.0 percent) and about the same (47.8 percent). Narrative responses demonstrated that resident satisfaction was very dependent upon the level of resident awareness. Family satisfaction was also split between more satisfied (41.7 percent) and about the same (53.0 percent). Respondents believing that family members were more satisfied noted that families appreciated the contact and interaction offered by NP/PAs involved in resident care. Those respondents who believed that the satisfaction was about the same commented that family members were not always aware of the program's benefits or had not made any comments about it to them.

Admission Caseload Acuity

Responses to our question regarding increased acuity levels of newly admitted patients indicated that the NP/PA presence had not prompted homes to admit sicker patients (raising the overall acuity level in the home). Only 20 (17.4 percent) of the respondents believed that the NP/PA presence had increased acuity of the admitting case mix; 89 (77.4 percent) noted no effect. Likewise, only 15 respondents (13.0 percent) believed the presence of the NP/PA had altered the home's admitting practice in any notable way. Ninety-three respondents (80.9 percent) did not believe that the home's admitting practices had changed during the study period.

Overall Preferences

When asked about the future and the preferred model of medical care, 92.7 percent of administrators and 91.6 percent of DNSs believed the demonstration model offered a stronger model of care delivery for nursing homes.

Analysis of the narrative comments revealed two major sub-themes. First, the presence of a mid-level practitioner had improved staff-physician communication in the home. Second, respondents reported increased accessibility, availability, and flexibility of NP/PA in providing care. Within the first theme, the NP/PA was cited as not only providing the necessary medical support for the nursing home staff but acting as a triage and an effective communicator with the physician as well. Within the second theme, the respondents believed that the care delivered to the residents was more personal, individualized, and better managed under the demonstration model. A very large majority also believed that the increased quality of medical care received by the residents in the demonstration model made it a far superior model of care delivery for nursing homes facing a future of greater acuity in their casemix. To quote one respondent, "If we want our elderly to receive proper care, we must provide interested doctors with the assistance they need to provide that care."

INTERPRETING THESE RESULTS

We believe that this survey adds an important dimension to the evaluation findings; however, some caution is necessary in interpreting the results. If the process of selecting nursing homes screens out many of the homes that would have been more negative about the program, then reported results may overstate those of a representative sample. Nursing homes did not self-select into the program, but they did have the option to refuse to participate. Nursing homes were asked to participate by the demonstration's physician groups, which appear to have exercised some discretion over the homes they asked to participate. Among those that were asked, not all agreed.

Early in the evaluation we conducted a telephone survey with 14 of the 16 physician groups about their selection of nursing homes and the patient enrollment process. Six of the 14 groups indicated that not all of the nursing homes in the geographic area that they served were approached. In general the groups indicated they were unlikely to approach homes (1) where they saw only a few patients, (2) that had few Medicaid patients, or (3) that were "geographically undesirable."

Ten of the 14 participating provider groups indicated that one or more of the nursing homes that they approached had refused to participate. Reasons given by nursing homes for refusing to participate included: (1) liability issues; (2) they didn't want physicians to lessen their presence in the nursing home; (3) they didn't want two standards of care; (4) they were reluctant to change, didn't want more paperwork; (5) they didn't want to approach conglomerate or corporate owners about the program; and (6) they didn't want more Medicaid program intervention.

Together, these responses suggest that nursing homes that were negatively predisposed to the program did not agree to participate. Certainly, those that agreed appear more willing to take risks and perhaps had stronger ties to participating physician groups. Despite these cautions, the near unanimous endorsement of the program is impressive.

VI. DISCUSSION AND POLICY IMPLICATIONS

The evaluation of the Nursing Home Connection demonstration found a modest improvement in both the quality and quantity of care provided to nursing home patients at no additional expense. NPs and PAs provided care at least comparable to that provided by physicians and showed real potential as part of the primary care team approach for nursing home patients. The effects that were detected generally benefited those patients under the care of demonstration providers. Administrators and directors of nursing in participating nursing homes indicated greater satisfaction with the demonstration program than was seen in the empirical data. Particular emphasis was placed on the greater responsiveness of the NP/PAs. In addition, the administrators and directors of nursing perceived increased amounts of care, better monitoring of both drugs and medical conditions, and improved patient functioning. Although it is difficult to assess process of care from nursing home medical records, our chart review data agreed with these perceptions for increased amounts of care and improved monitoring of tracer conditions. No effects were detected on drug use and physical functioning.

In the cost component of the evaluation, we found that for patients who had been in the nursing home for some period of time before enrolling (the rollovers), the demonstration produced substantially fewer very high and very low cost patients; that is, demonstration patients showed significantly lower variation in their expenditures per day. Multivariate analyses indicated demonstration patients consistently had somewhat lower expenditures per study day, but those differences were never statistically significant. Further analysis indicated that lower hospital costs for demonstration patients constituted most of the difference. The difference in hospital costs per study day was statistically significant when all patients are weighted equally, but not when patients are weighted by their time in the study, suggesting that the largest reductions occurred in those patients with relatively short stays within the study period.

In part, the absence of a statistically significant cost savings may result from the limited power of our sample sizes to detect important real differences. With the available samples our power to detect a true 25 percent reduction in costs was 85 percent for rollovers and 55 percent for new admissions. To detect a 20 percent reduction in costs the power in the rollover sample fell to 65 percent and to only 35 percent for the new admissions group. We had very limited power to observe smaller differences. This is a potentially important limitation of the cost analysis. A program that showed modest improvements in quality of care, enhanced the satisfaction of nursing home administrators and directors of nursing, and reduced costs by 5 to 10 percent would be very welcome. In all likelihood with the available sample, we would not detect this size difference.

The results of this demonstration may have been muted by the nature of the patients enrolled. Although other studies have shown that much of the activity with nursing home patients occurs in the first three months after admission, the majority of subjects in this study were rollovers who had been in the nursing home longer. This preponderance of long-term cases can be traced to the requirement that the participants be Medicaid recipients. Becoming Medicaid eligible usually involves first spending one's own resources, which takes some time. Thus the proportion of residents on Medicaid increases with their length of stay.

Most of the demonstration's new provider groups were operating well below their maximum enrollment and hence used the NP/PAs on only a part-time basis. Most also worked in several different nursing homes. Greater saturation within a given nursing home might have

produced a more dramatic effect on nursing staff performance. Even as it was, many NP/PAs spent time giving in-service training to nursing home staffs, as a means of improving care and as a way to attract patient referrals.

The demonstration intervention included two inseparable components: the use of non-physician providers to substitute for physicians on many primary care tasks and a general loosening of the restrictions on the numbers of reimbursed visits to nursing home patients. While it is impossible to separate the effects of these components in the demonstration design, each component raises different issues.

Our results clearly show that NP/PAs are adequate as substitutes for physicians within the scope of practice prescribed by the demonstration. Recently implemented regulations allow reimbursement, capped at 85 percent of the physician billing rate, for nursing home visits by physician assistants working under the direction of physicians. This demonstration reimbursed all provider visits, physicians, NPs, and PAs, at the same rate. No current provisions exist, outside the context of this demonstration, for reimbursement of nursing home visits by nurse practitioners.

Most of the manpower substitution literature looks at the cost effectiveness of physician substitutes as less skilled and therefore lower paid practitioners. In this demonstration, all practitioners were reimbursed at the same level, removing this potential source of cost savings. As a result in this model, cost savings could be achieved only through reductions in other generally more expensive services, a more stringent test than faced by other manpower substitution programs. In particular, if reimbursement rates for nurse practitioners and physician assistants are established at less than 100 percent of the physician rate (as has already been done for physician assistants), greater savings will accrue. This potential will not be achieved if lower reimbursement rates do not attract nurse practitioners and physician assistants into nursing home care.

Allowing more paid provider visits did not lead to increased public expenditures. In general, few cases averaged more than two visits per month. A more flexible policy recognizes the heterogeneity of the nursing home population. Each person is at risk of some crisis in addition to a need of some regular maintenance care. It seems feasible to establish a policy that allows for more than a single visit per month but provides for a threshold beyond which more careful scrutiny is encouraged. A policy that encourages care in the nursing home may lead to at least some reduction in hospital use. In this instance, that is precisely what happened. The costs of the increased medical attention in the nursing home were more than offset by a reduction in hospital use.

This study used an approach built around using non-physicians as physician surrogates, in the tradition of other manpower substitution efforts (Sox, 1979). An alternative approach to improving nursing home care is to add a nurse practitioner to the staff of the nursing home. This was the dominant model of the Robert Wood Johnson Teaching Nursing Home demonstration (Mezey, Lynauch, and Cartier, 1989) and was also used in a more extensive demonstration in the western (Mountain) United States (Kane et al., 1989; Buchanan et al., 1989a). Although each of these projects differed slightly in the intervention and its evaluation, the findings are impressively consistent: modest improvements in quality with no added cost.

The similarities in results between the present study and the Mountain States project are especially striking, because both projects used essentially the same instrument to abstract the charts. If anything, the Mountain States data show a slightly greater effect, especially with regard to reducing hospital use. Taken together, these two studies suggest that non-physician providers, especially nurse practitioners, have an important contribution to make in improving the care of nursing home patients.

Appendix A

UNIVERSITY OF MINNESOTA NURSING HOME RECORD REVIEW FORM

Record 01
12

Idcode
14 29

Appendix A

UNIVERSITY OF MINNESOTA NURSING HOME RECORD REVIEW FORM

LABEL

2. ABSTRACTOR ID CODE: ☐☐ (30)

3. DATE ABSTRACTED
MO ☐☐ (32) DA ☐☐ (34) YR ☐☐ (36)

4 BEGIN TIME: ☐☐ (38) ☐☐ AM/PM

5 TIME TO ABSTRACT: ☐☐☐ (42) MINUTES

DO NOT WRITE IN THIS BOX

EDITOR ID: ☐☐

DATE EDITED:
MO ☐☐ DA ☐☐ YR ☐☐

EDIT STATUS:
☐ COMPLETE
☐ MISSING DATA

LABEL CORRECTIONS

FORM 00

1

LABEL

SCREENING RULES FOR CONTINUING ABSTRACT

1 CAN A NURSING HOME RECORD BE FOUND FOR THIS RESIDENT?

1 ☐ YES

2 ☐ NO → **[DO NOT ABSTRACT THIS RECORD]**

2 IS THIS RESIDENT AN EXPERIMENTAL? [NOTE: IF THE FIRST DIGIT OF THE FIELD ID NUMBER IS 1, THEN THIS RESIDENT IS AN EXPERIMENTAL]

1 ☐ YES →

2 ☐ NO

3. IS THERE EVIDENCE THAT THIS RESIDENT WAS ENROLLED IN THE DEMONSTRATION?

1 ☐ YES

2 ☐ NO → **[DO NOT ABSTRACT THIS RECORD]**

LABEL CORRECTIONS

4 Does resident status (A/R) determined on worksheet agree with resident status (A/R) on label?

1 ☐ NO →

5. ORIGINAL NURSING HOME ADMISSION DATE

MO ☐☐ DA ☐☐ YR ☐☐

[Copy Date 2 from Worksheet]

2 ☐ YES ↓

6 ☐☐☐☐☐☐☐☐☐☐☐☐

FIRST MEDICARE NUMBER

7 ☐☐☐☐☐☐☐☐☐☐☐☐

SECOND MEDICARE NUMBER

8 ENROLLMENT DATE

MO ☐☐ DA ☐☐ YR ☐☐

[Copy Date 1 from Worksheet]

UNIVERSITY OF MINNESOTA
NURSING HOME RECORD
REVIEW FORM

FORM 01

IDENTIFYING DATA

6 RESIDENT STATUS FROM WORKSHEET ☐ A/R
45

7 DATE OF BIRTH:
MO ☐☐ DA ☐☐ YR ☐☐
46

8 SEX
52
1 ☐ MALE
2 ☐ FEMALE

9 ENROLLMENT DATE:
MO ☐☐ DA ☐☐ YR ☐☐
53
[Copy Date 1 from Worksheet]

*10 Is there evidence that the resident's physician prov der group changed from a non-participating provider group to a participating provider group at point of enrollment in the demonstration?
59
1 ☐ YES
2 ☐ NO

*11 What was the original date of admission to the nursing home?
MO ☐☐ DA ☐☐ YR ☐☐
60
[Copy Date 2 from Worksheet]

*12 Resident was originally admitted from:
66
1 ☐ Acute Hospital
2 ☐ Chronic Disease/Rehabilitation Hospital
3 ☐ Another Nursing Home
4 ☐ Rest Home/Level IV Facility
5 ☐ Home/Community
6 ☐ Other, _____
8 ☐ NOT RECORDED IN NURSING HOME RECORD

IDENTIFYING DATA - CONTINUED

DIAGNOSIS ON ADMISSION TO NURSING HOME

	PHYSICIAN'S DIAGNOSIS	DIAGNOSTIC CODES ICD-9-CM	
		Alpha	Numeric
a		67	
b		71	
c		75	
d		79	
e		83	
f		87	
g		91	
h		95	
i		99	
j		103	
k		107	
l		111	
m		115	
n		119	
o		123	

IDENTIFYING DATA - CONTINUED

14 Resident at the END OF STUDY [Date 4 from Worksheet] was:

1 ☐ ALIVE IN NURSING HOME
2 ☐ DIED WHILE IN NURSING HOME → [SKIP TO FORM 02, PAGE 6]
3 ☐ DISCHARGED ALIVE FROM NURSING HOME

15 Resident was DISCHARGED TO

1 ☐ Acute Hospital → [SKIP TO ITEM 16]

2 ☐ Chronic Disease/ Rehabilitation Hospital
3 ☐ Another Nursing Home
4 ☐ Rest Home/ Level IV Facility
5 ☐ Home/Community
6 ☐ Other
8 ☐ NOT RECORDED IN NURSING HOME RECORD
→ [SKIP TO FORM 02, PAGE 6]

16 Upon discharge from acute hospital, what was resident's DRG code?

☐☐☐
DRG Code

17 What was resident's condition following hospitalization?

1 ☐ Discharged Dead →

18. Did the resident die within 48 hours of hospital admission?

1 ☐ YES
2 ☐ NO

2 ☐ Discharged Alive →

19 Resident was discharged to

1 ☐ Nursing Home
2 ☐ Home/Community
3 ☐ Other, _____
8 ☐ NOT KNOWN

SKIP TO FORM 02, PAGE 6

UTILIZATION OF NURSING HOME SERVICES

FORM 02

PRE-DEMONSTRATION PERIOD

FOR ROLLOVERS ONLY

* Is the resident a ROLLOVER or a NEW ADMIT?

1 ☐ ROLLOVER ——→ [IF ROLLOVER, SKIP TO ITEM 2, PAGE 7]

2 ☐ NEW ADMIT ——→ [IF NEW ADMIT, SKIP TO ITEM 45, PAGE 11]

UTILIZATION OF NURSING HOME SERVICES-CONTINUED

PRE DEMO PERIOD - ROLLOVER ONLY

2 BEGINNING OF STUDY MO DA YR [Copy Date 5a from Worksheet] TO ENROLLMENT DATE MO DA YR [Copy Date 5b from Worksheet]

3 Were there WRITTEN ORDERS by either an MD/NP/PA?

1 ☐ YES → RECORD THE NUMBER OF WRITTEN ORDERS

2 ☐ NO

4 Medications ____ 150

5 Laboratory/X-rays ____ 152

6 Special Services ____ 154

7 Nursing Actions/Interventions ____ 156

8 Were there TELEPHONE ORDERS by either an MD/NP/PA?

1 ☐ YES → RECORD THE NUMBER OF TELEPHONE ORDERS

2 ☐ NO

9 Medications ____ 159

10 Laboratory/X-rays ____ 161

11 Special Services ____ 163

12 Nursing Actions/Interventions ____ 165

		IN NH	OUTSIDE NH
13	What are the number of primary care MD visits WITH EXAMINATION? ____	167	169
14	What are the number of primary care MD visits WITHOUT EXAMINATION? ____	171	173
15	What are the number of NP/PA visits WITH EXAMINATION? ____	175	177
16	What are the number of NP/PA visitsWITHOUT EXAMINATION? ____	179	181

PRE DEMO PERIOD - UTILIZATION OF NURSING HOME SERVICES - CONTINUED

		IN NH	OUTSIDE NH
17	What are the number of visits to an MD specialist [other than primary care provider]? ——— 183		185

18 Was the resident given a DENTAL EXAMINATION? 187

1 ☐ YES → 19. What are the number of DENTAL EXAMINATIONS 188

2 ☐ NO

	WAS CORRECTIVE ACTION:		YES	NO
20.	Recommended?	190	1 ☐	2 ☐
21	Taken?	191	1 ☐	2 ☐

22 Was the resident given a HEARING TEST? 192

1 ☐ YES →

2 ☐ NO

	WAS CORRECTIVE ACTION:		YES	NO
23.	Recommended?	193	1 ☐	2 ☐
24.	Taken?	194	1 ☐	2 ☐

25 Was the resident given an EYE EXAMINATION? 195

1 ☐ YES →

2 ☐ NO

	WAS CORRECTIVE ACTION:		YES	NO
26.	Recommended?	196	1 ☐	2 ☐
27.	Taken?	197	1 ☐	2 ☐

28	What are the number of PHYSICAL THERAPY SESSIONS? ———	198	
29	What are the number of OCCUPATIONAL THERAPY SESSIONS? ———	201	
30	What are the number of PODIATRY VISITS? ———	204	
31	What are the number of visits to a HOSPITAL EMERGENCY ROOM OR OPD - NOT JUST FOR TESTS? ———	206	
32	What are the number of visits to a HOSPITAL EMERGENCY ROOM OR OPD - FOR TESTS? ———	208	
33	What are the number of HOSPITAL ADMISSIONS? [IF NO HOSPITALIZATIONS, SKIP TO ITEM 44, PAGE 11] ———	210	

PRE DEMO PERIOD - UTILIZATION OF NURSING HOME SERVICES - CONTINUED

BEGINNING WITH THE FIRST HOSPITALIZATION AS NUMBER ONE, RECORD UP TO FIVE HOSPITALIZATIONS DURING THIS PERIOD.

34 Hospitalization Date One:

	FROM MO	FROM DA	FROM YR		TO MO	TO DA	TO YR
212	☐☐	☐☐	☐☐	218	☐☐	☐☐	☐☐

35 Reason for Hospitalization:

224 1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

36 Hospitalization Date Two:

	FROM MO	FROM DA	FROM YR		TO MO	TO DA	TO YR
225	☐☐	☐☐	☐☐	231	☐☐	☐☐	☐☐

37 Reason for Hospitalization:

237 1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

38 Hospitalization Date Three:

	FROM MO	FROM DA	FROM YR		TO MO	TO DA	TO YR
238	☐☐	☐☐	☐☐	244	☐☐	☐☐	☐☐

39 Reason for Hospitalization:

250 1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

40 Hospitalization Date Four:

	FROM MO	FROM DA	FROM YR		TO MO	TO DA	TO YR
251	☐☐	☐☐	☐☐	257	☐☐	☐☐	☐☐

41 Reason for Hospitalization:

263 1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

42 Hospitalization Date Five:

	FROM MO	FROM DA	FROM YR		TO MO	TO DA	TO YR
264	☐☐	☐☐	☐☐	270	☐☐	☐☐	☐☐

43 Reason for Hospitalization:

276 1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

UTILIZATION OF NURSING HOME SERVICES

DEMONSTRATION PERIOD

FOR ROLLOVERS AND NEW ADMITS

DEMO PERIOD - UTILIZATION OF NURSING HOME SERVICES - CONTINUED

DEMO PERIOD - ROLLOVER

44 ENROLLMENT DATE MO DA YR [Copy Date 6a from Worksheet] TO END OF STUDY MO DA YR [Copy Date 6b from Worksheet]

DEMO PERIOD - NEW ADMIT

45 ENROLLMENT DATE MO DA YR [Copy Date 7a from Worksheet] TO END OF STUDY MO DA YR [Copy Date 7b from Worksheet]

46 *Were there* WRITTEN ORDERS by either an MD/NP/PA?

1 ☐ YES → RECORD THE NUMBER OF WRITTEN ORDERS

2 ☐ NO

47 Medications ____ 302

48 Laboratory/X-rays ____ 304

49 Special Services ____ 306

50 Nursing Actions/Interventions ____ 308

51 Were there TELEPHONE ORDERS by either an MD/NP/PA?

1 ☐ YES → RECORD THE NUMBER OF TELEPHONE ORDERS

2 ☐ NO

52 Medications ____ 311

53 Laboratory/X-rays ____ 313

54 Special Services ____ 315

55 Nursing Actions/Interventions ____ 317

		IN NH	OUTSIDE NH
56	What are the number of primary care MD visits WITH EXAMINATION? ____ 319		321
57	What are the number of primary care MD visits WITHOUT EXAMINATION? ____ 323		325

DEMO PERIOD - UTILIZATION OF NURSING HOME SERVICES - CONTINUED

		IN NH	OUTSIDE NH
58	What are the number of NP/PA visits WITH EXAMINATION? ____ 327	329	
59	What are the number of NP/PA visits WITHOUT EXAMINATION? ____ 331	333	
60	What are the number of visits to an MD specialist [other than primary provider]? 335	337	

61 Was the resident given a DENTAL EXAMINATION?

339 1 ☐ YES → 62. What are the number of DENTAL EXAMINATIONS? 340 ☐☐

2 ☐ NO

	WAS CORRECTIVE ACTION:		YES	NO
63.	Recommended?	342	1 ☐	2 ☐
64	Taken?	343	1 ☐	2 ☐

65 Was the resident given a HEARING TEST?

344 1 ☐ YES → WAS CORRECTIVE ACTION:

2 ☐ NO

			YES	NO
66	Recommended?	345	1 ☐	2 ☐
67	Taken?	346	1 ☐	2 ☐

68 Was the resident given an EYE EXAMINATION?

347 1 ☐ YES → WAS CORRECTIVE ACTION:

2 ☐ NO

			YES	NO
69.	Recommended?	348	1 ☐	2 ☐
70.	Taken?	349	1 ☐	2 ☐

71	What are the number of PHYSICAL THERAPY SESSIONS? ____ 350	☐☐☐	
72	What are the number of OCCUPATIONAL THERAPY SESSIONS? ____ 353	☐☐☐	
73	What are the number of PODIATRY VISITS? ____ 356	☐☐	
74	What are the number of visits to a HOSPITAL EMERGENCY ROOM OR OPD - NOT JUST FOR TESTS? ____ 358	☐☐	
75	What are the number of visits to a HOSPITAL EMERGENCY ROOM OR OPD - FOR TESTS? ____ 360	☐☐	
76	What are the number of HOSPITAL ADMISSIONS? [IF NO HOSPITALIZATIONS, SKIP TO FORM 03, PAGE 14] ____ 362	☐☐	

DEMO PERIOD - UTILIZATION OF NURSING HOME SERVICES - CONTINUED

BEGINNING WITH THE FIRST HOSPITALIZATION AS NUMBER ONE, RECORD UP TO FIVE HOSPITALIZATIONS DURING THIS PERIOD

77 Hospitalization Date One

	FROM MO	FROM DA	FROM YR	TO MO	TO DA	TO YR

78 Reason for Hospitaliztion

1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

79 Hospitalization Date Two

	FROM MO	FROM DA	FROM YR	TO MO	TO DA	TO YR

80 Reason for Hospitaliztion:

1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

81 Hospitalization Date Three

	FROM MO	FROM DA	FROM YR	TO MO	TO DA	TO YR

82 Reason for Hospitalization:

1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

83 Hospitalization Date Four:

	FROM MO	FROM DA	FROM YR	TO MO	TO DA	TO YR

84 Reason for Hospitalization

1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

85 Hospitaliztion Date Five

	FROM MO	FROM DA	FROM YR	TO MO	TO DA	TO YR

86 Reason for Hospitalization

1 ☐ Emergency 2 ☐ Elective 8 ☐ NOT RECORDED

TRACER CONDITIONS

Form 03

PRE-DEMONSTRATION PERIOD

FOR ROLLOVERS ONLY

1 Is the resident a ROLLOVER or a NEW ADMIT?

1 ☐ ROLLOVER ⟶ [IF ROLLOVER, SKIP TO ITEM 2, PAGE 15]

2 ☐ NEW ADMIT ⟶ [IF NEW ADMIT, SKIP TO PAGE 26]

TRACER CONDITIONS

FORM 03

PRE DEMO PERIOD - ROLLOVER

2 BEGINNING OF STUDY — MO DA YR [ ][ ] [ ][ ] [ ][ ] — [Copy Date 5a from Worksheet]

TO

ENROLLMENT DATE — MO DA YR [ ][ ] [ ][ ] [ ][ ] — [Copy Date 5b from Worksheet]

DIABETES

3 Does the resident have a diagnosis of diabetes mellitus in the record?

1 ☐ YES →

2 ☐ NO

4 How often are urine sugars or Chemstrips recorded?

1 ☐ Everyday
2 ☐ Several times a week
3 ☐ About once a week
4 ☐ 2-3 times a month
5 ☐ About once a month
6 ☐ Less than once a month
8 ☐ NO RECORD

5 Is there ever a pattern of at least three positive tests out of six consecutive tests?

1 ☐ YES →

2 ☐ NO

6 How many times were there 3 of 6 positive tests? [ ][ ]

7 How many times was the MD/NP/PA notified? [ ][ ]

8 How many times was the medication changed? [ ][ ]

9 Is a diabetic diet ordered or a note explaining why it is not ordered in the record?

1 ☐ YES
2 ☐ NO

[If No, Skip to Item 14, Page 17]

PRE DEMO - ROLLOVER

DIABETES TRACER-CONTINUED

10. Does the resident receive foot and nail care?

453 1 ☐ YES → 11. How often does the resident receive foot and nail care?

2 ☐ NO

1 ☐ At least once a week
2 ☐ 2-3 times a month
3 ☐ About once a month
454 4 ☐ About 2 times every three months
5 ☐ About once every three months
6 ☐ Less than once every three months
8 ☐ NO RECORD

12. Does the resident receive eye examinations

455 1 ☐ YES → 13. How often does the resident receive eye examinations?

2 ☐ NO

1 ☐ More than once every six months
2 ☐ About every six months
456 3 ☐ About once during this period
8 ☐ NO RECORD

PRE DEMO - ROLLOVER

CONGESTIVE HEART FAILURE

14 Does the resident have a diagnosis of congestive heart failure in the record?

1☐ YES →

2☐ NO

15 How often was weight recorded?

1☐ At least once a week
2☐ 2-3 times a month
3☐ About once a month
458 4☐ About 2 times every three months
5☐ About once every three months
6☐ At least once subsequent to admission
8☐ NO RECORD

16. Did weight increase more than an average of 3 pounds per month for two or more consecutive months?

1☐ YES →
459
2☐ NO

17. Was an MD/NP/PA notified?

	YES	NO
460	1☐	2☐

18. Was the resident on a sodium-restricted diet?

461 1☐ YES
2☐ NO

19. Did the resident receive diuretics?

1☐ YES →
462
2☐ NO

20. Was potassium supplementation or spironolactone prescribed?

	YES	NO
463	1☐	2☐

21 Were electrolytes (Na^+ and K^+) checked?

464 1☐ 2☐

[If YES, How often were electrolytes checked?]

465 ☐☐

[If No, Skip to Item 24 Page 19]

PRE DEMO - ROLLOVER

CONGESTIVE HEART FAILURE-CONTINUED

22. How often is there a record of a physical examination for edema?

- 1 ☐ At least once a week
- 2 ☐ 2-3 times a month
- 3 ☐ About once a month
- 4 ☐ About 2 times every three months
- 5 ☐ About once every three months
- 6 ☐ 1-3 times during the period
- 8 ☐ NO RECORD

23 How often is there a record of a physical examination for breath sounds?

- 1 ☐ At least once a week
- 2 ☐ 2-3 times a month
- 3 ☐ About once a month
- 4 ☐ About 2 times every three months
- 5 ☐ About once every three months
- 6 ☐ 1-3 times during the period
- 8 ☐ NO RECORD

PRE DEMO - ROLLOVER

HYPERTENSION

24. Does the resident have a diagnosis of hypertension in the nursing home record?

469 1 ☐ Yes →

2 ☐ No →

25. How often is blood pressure recorded?

470 1 ☐ At least once a week
2 ☐ 2-3 times a month
3 ☐ About once a month
4 ☐ 1-2 times every three months
5 ☐ Less than once every three months
8 ☐ NO RECORD

26. Are there three consecutive blood pressure readings with systolic BP of more that 160 mm Hg or less than 100 mm Hg; or a diastolic BP of more than 100 mm Hg or less than 60 mm Hg?

471 1 ☐ YES →
2 ☐ NO →

27. Was an MD/NP/PA notified within 24 hours?

	YES	NO
472	1 ☐	2 ☐

28. Was the resident on a sodium-restricted diet?

473 1 ☐ YES
2 ☐ NO

29. Did the resident receive diuretics?

474 1 ☐ YES →
2 ☐ NO →

30. Was potassium supplementation or spironolactone prescribed?

	YES	NO
475	1 ☐	2 ☐

31. Were electrolytes (Na^+ and K^+) checked?

476 1 ☐ 2 ☐

[If YES, How often were electrolytes checked?

477 ☐☐

32. Did the resident complain of dizziness or fall?

479 1 ☐ YES →
2 ☐ NO →

33. Was blood pressure checked for postural hypotension?

	YES	NO
480	1 ☐	2 ☐

[If No, Skip to Item 34, Page 20]

PRE DEMO - ROLLOVER

IDENTIFY WHETHER THERE ARE FEVER EPISODES RECORDED BEGINNING WITH THE MOST RECENT FEVER EPISODE AS NUMBER ONE. ANSWER QUESTIONS 34 THROUGH 57 FOR THE THREE MOST RECENT FEVER EPISODES DURING THIS PERIOD

FEVER EPISODE NUMBER ONE

34 Was there an oral (or equivalent rectal) temperature greater than 100° F or 37.7° C for 12 hours or more?

1 ☐ YES →

2 ☐ NO →

35 Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
482	1 ☐	2 ☐

36 Is there a record of a chest examination for breath sounds?

483	1 ☐	2 ☐

37 Is there record of a chest X-ray ordered?

484	1 ☐	2 ☐

38 Was there a urinalysis ordered?

485	1 ☐	2 ☐

39 Is there a record of antibiotics being prescribed?

486	1 ☐	2 ☐

40 Was hydration increased or a note written to explain why not?

487	1 ☐	2 ☐

41 What was the outcome?

	IMPROVED	WORSENED/ HOSPITALIZED	DIED
488	1 ☐	2 ☐	3 ☐

(If No: Skip to Item 58, Page 23)

PRE DEMO - ROLLOVER

FEVER EPISODE NUMBER TWO

42 Was there an oral (or equivalent rectal) temperature greater than 100° F or 37.7° C for 12 hours or more?

491 1 ☐ YES → 2 ☐ NO

43. Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
490	1 ☐	2 ☐

44 Is there a record of a chest examination for breath sounds?

492	1 ☐	2 ☐

45 Is there record of a chest X-ray ordered?

492	1 ☐	2 ☐

46. Was there a urinalysis ordered?

493	1 ☐	2 ☐

47. Is there a record of antibiotics being prescribed?

494	1 ☐	2 ☐

48. Was hydration increased or a note written to explain why not?

495	1 ☐	2 ☐

49. What was the outcome?

	IMPROVED	WORSENED/ HOSPITALIZED	DIED
496	1 ☐	2 ☐	3 ☐

[If No, Skip to Item 58, Page 23]

PRE DEMO - ROLLOVER

FEVER EPISODE NUMBER THREE

50 Was there an oral (or equivalent rectal) temperature greater than 100° F or 37.7° C for 12 hours or more?

497 1 ☐ YES → 2 ☐ NO

51 Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
498	1 ☐	2 ☐

52 Is there a record of a chest examination for breath sounds?

499	1 ☐	2 ☐

53 Is there record of a chest X-ray ordered?

500	1 ☐	2 ☐

54 Was there a urinalysis ordered?

501	1 ☐	2 ☐

55 Is there a record of antibiotics being prescribed?

502	1 ☐	2 ☐

56 Was hydration increased or a note written to explain why not?

503	1 ☐	2 ☐

57 What was the outcome?

	IMPROVED	WORSENED/ HOSPITALIZED	DIED
504	1 ☐	2 ☐	3 ☐

[If No Skip to Item 58 Page 23]

PRE DEMO - ROLLOVER

URINARY INCONTINENCE

58 Is there a diagnosis of urinary incontinence or a nurse's note about a problem of urinary accidents, bedwetting, et cetera

505 1 ☐ YES → 59 Was there an episode of urinary incontinence in a previously continent resident?

2 ☐ NO

506 1 ☐ YES → 60 Was an MD/NP/PA notified within 24 hours?

	YES	NO
507	1 ☐	2 ☐

61 Was a urinalysis ordered?

508 1 ☐ 2 ☐

62 Was a urine culture ordered?

509 1 ☐ 2 ☐

2 ☐ NO ↓

63 Is there evidence of a chronic problem of urinary incontinece?

510 1 ☐ YES → 64 Was problem evaluated by a physician or referred to a urologist?

2 ☐ NO ↓

	YES	NO, PREVIOUSLY EVALUATED	NO, NEVER EVALUATED
511	1 ☐	2 ☐	3 ☐

[IF NO, SKIP TO ITEM 69, PAGE 24]

65 If chronic incontinence, is resident cognitively impaired or bedfast?

512 1 ☐ YES → [IF YES, SKIP TO ITEM 69, PAGE 24]

2 ☐ NO → 66 Was resident encouraged to use bathroom or was urinal at bedside?

	YES	NO
513	1 ☐	2 ☐

67 Is there evidence of an effort at bladder training or scheduled toileting?

514 1 ☐ 2 ☐

68 Was resident maintained on an indwelling catheter for more than 2 weeks?

515 1 ☐ 2 ☐

[If No, Skip to Item 69, Page 24]

PRE DEMO - ROLLOVER

FEEDING

69 Is there an indication in the nurse's notes that the resident ever needed to be fed?

- 1 ☐ YES → 70 Is there a care plan to encourage resident to feed self?
  - 1 ☐ YES
  - 2 ☐ NO
  - 71 Has the resident been enrolled in a program to train or encourage self-feeding?
    - 1 ☐ YES
    - 2 ☐ NO
    - 72 Does the resident improve feeding ability?
      - 1 ☐ YES, feeds self
      - 2 ☐ YES, still requires assistance
      - 3 ☐ NO
- 2 ☐ NO

[If No, Skip to Item 73, Page 25]

PRE DEMO - ROLLOVER

CONFUSION

73 Is there any indication in the nurse's notes that the resident who was NOT previously confused experienced sustained confusion (noted by 3 out of 5 consecutive shifts)?

5 2 0 1 ☐ YES → 2 ☐ NO

WERE ANY OF THE FOLLOWING EVALUATIONS DONE TO DETERMINE THE CAUSE OF CONFUSION?

		YES	NO
74.	Neurologic evaluation 5 2 1	1 ☐	2 ☐
75.	Psychiatric consultation 5 2 2	1 ☐	2 ☐
76.	CT Scan 5 2 3	1 ☐	2 ☐
77.	Electrolytes checked (Na^+ and K^+) 5 2 4	1 ☐	2 ☐
78	Blood sugar checked 5 2 5	1 ☐	2 ☐
79.	Thyroid test 5 2 6	1 ☐	2 ☐
80	Evaluation of drug regimen 5 2 7	1 ☐	2 ☐
81	Vital signs taken within 2 hours of first bout of confusion 5 2 8	1 ☐	2 ☐

[* No Skip to Item 82, Page 27]

TRACER CONDITIONS

DEMONSTRATION PERIOD

FOR ROLLOVERS AND NEW ADMITS

DEMO - ROLLOVER OR NEW ADMIT

DEMO PERIOD - ROLLOVER

82 ENROLLMENT DATE TO END OF STUDY

	MO	DA	YR		MO	DA	YR

[Copy Date 6a from Worksheet] [Copy Date 6b from Worksheet]

DEMO PERIOD - NEW ADMIT -

83 ENROLLMENT DATE TO END OF STUDY

	MO	DA	YR		MO	DA	YR

[Copy Date 7a from Worksheet] [Copy Date 7b from Worksheet]

DIABETES

84 Does the resident have a diagnosis of diabetes mellitus in the record?

1 ☐ YES →

2 ☐ NO

85. How often are urine sugars or Chemstrips recorded?

1 ☐ Everyday
2 ☐ Several times a week
3 ☐ About once a week
4 ☐ 2-3 times a month
5 ☐ About once a month
6 ☐ Less than once a month
8 ☐ NO RECORD

86 Is there ever a pattern of at least three positive tests out of six consecutive tests?

1 ☐ YES →
2 ☐ NO

87 How many times were there 3 of 6 positive tests? ☐☐

88 How many times was the MD/NP/PA notified? ☐☐

89 How many times was the medication changed? ☐☐

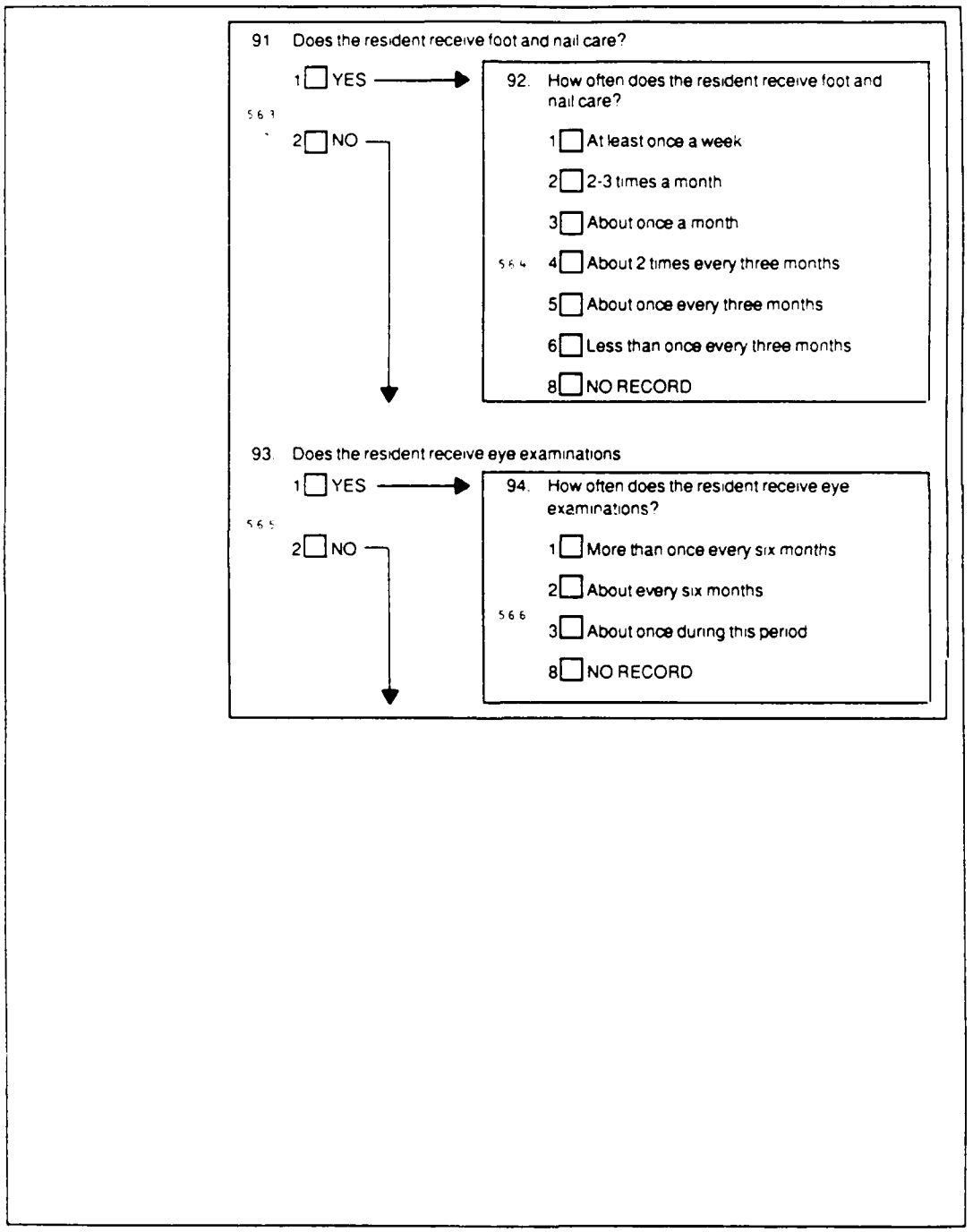
90 Is a diabetic diet ordered or a note explaining why it is not ordered in the record?

1 ☐ YES
2 ☐ NO

[If No Skip to Item 95 Page 29]

DEMO - ROLLOVER OR NEW ADMIT

DIABETES TRACER - CONTINUED



DEMO - ROLLOVER OR NEW ADMIT

CONGESTIVE HEART FAILURE

95 Does the resident have a diagnosis of congestive heart failure in the record?

1☐ YES →

2☐ NO →

96 How often was weight recorded?

1☐ At least once a week
2☐ 2-3 times a month
3☐ About once a month
4☐ About 2 times every three months
5☐ About once every three months
6☐ At least once subsequent to admission
8☐ NO RECORD

97 Did weight increase more than an average of 3 pounds per month for two or more consecutive months?

1☐ YES →

2☐ NO →

98 Was an MD/NP/PA notified?

	YES	NO
	1☐	2☐

99 Was the resident on a sodium-restricted diet?

1☐ YES
2☐ NO

100 Did the resident receive diuretics?

1☐ YES →

2☐ NO →

101 Was potassium supplementation or spironolactone prescribed?

	YES	NO
	1☐	2☐

102 Were electrolytes (Na^+ and K^+) checked?

1☐ 2☐

[If YES, How often were electrolytes checked?]

☐☐

[If No, Skip to Item 105, Page 31]

DEMO - ROLLOVER OR NEW ADMIT

CONGESTIVE HEART FAILURE-CONTINUED

103 How often is there a record of a physical examination for edema?

- 1 ☐ At least once a week
- 2 ☐ 2-3 times a month
- 3 ☐ About once a month
- 4 ☐ About 2 times every three months
- 5 ☐ About once every three months
- 6 ☐ 1-3 times during the period
- 8 ☐ NO RECORD

104 How often is there a record of a physical examination for breath sounds?

- 1 ☐ At least once a week
- 2 ☐ 2-3 times a month
- 3 ☐ About once a month
- 4 ☐ About 2 times every three months
- 5 ☐ About once every three months
- 6 ☐ 1-3 times during the period
- 8 ☐ NO RECORD

DEMO - ROLLOVER OR NEW ADMIT

HYPERTENSION

105. Does the resident have a diagnosis of hypertension in the nursing home record?

579 1☐ Yes → 106 How often is blood pressure recorded?

580 1☐ At least once a week
2☐ 2-3 times a month
3☐ About once a month
4☐ 1-2 times every three months
5☐ Less than once every three months
8☐ NO RECORD

2☐ No → [If No, Skip to Item 115, Page 32]

107 Are there three consecutive blood pressure readings with systolic BP of more that 160 mm Hg or less tha 100 mm Hg, or a diastolic BP of more than 100 mm Hg or less than 60 mm Hg?

581 1☐ YES → 108 Was an MD/NP/PA notified within 24 hours?

582 YES 1☐ NO 2☐

2☐ NO →

109 Was the resident on a sodium-restricted diet?

583 1☐ YES
2☐ NO

110. Did the resident receive diuretics?

584 1☐ YES → 111 Was potassium supplementation or spironolactone prescribed?

585 YES 1☐ NO 2☐

112 Were electrolytes (Na^+ and K^+) checked?

586 1☐ 2☐

[If Yes, How often were electrolytes checked?]

587 ☐☐

2☐ NO →

113 Did the resident complain of dizziness or fall?

589 1☐ YES → 114 Was blood pressure checked for postural hypotension?

590 YES 1☐ NO 2☐

2☐ NO →

DEMO - ROLLOVER OR NEW ADMIT

IDENTIFY WHETHER THERE ARE FEVER EPISODES RECORDED. BEGINNING WITH THE MOST RECENT FEVER EPISODE AS NUMBER ONE, ANSWER QUESTIONS 115 THROUGH 138 FOR THE THREE MOST RECENT FEVER EPISODES DURING THIS PERIOD

FEVER EPISODE NUMBER ONE

115 Was there an oral (or equivalent rectal) temperature greater than 100°F or 37.7°C for 12 hours or more?

591 1 ☐ YES → 2 ☐ NO

116 Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
592	1 ☐	2 ☐

117 Is there a record of a chest examination for breath sounds?

593 1 ☐ 2 ☐

118 Is there record of a chest X-ray ordered?

594 1 ☐ 2 ☐

119 Was there a urinalysis ordered?

595 1 ☐ 2 ☐

120 Is there a record of antibiotics being prescribed?

596 1 ☐ 2 ☐

121 Was hydration increased or a note written to explain why not?

597 1 ☐ 2 ☐

122 What was the outcome?

	IMPROVED	WORSENED HOSPITALIZED	DIED
598	1 ☐	2 ☐	3 ☐

[If No, Skip to Item 139, Page 35]

DEMO - ROLLOVER OR NEW ADMIT

FEVER EPISODE NUMBER TWO

123. Was there an oral (or equivalent rectal) temperature greater than 100° F or 37.7° C for 12 hours or more?

594 1 ☐ YES → 2 ☐ NO

124. Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
600	1 ☐	2 ☐

125. Is there a record of a chest examination for breath sounds?

601	1 ☐	2 ☐

126. Is there record of a chest X-ray ordered?

602	1 ☐	2 ☐

127. Was there a urinalysis ordered?

603	1 ☐	2 ☐

128. Is there a record of antibiotics being prescribed?

604	1 ☐	2 ☐

129. Was hydration increased or a note written to explain why not?

605	1 ☐	2 ☐

130. What was the outcome?

	IMPROVED	WORSENED/ HOSPITALIZED	DIED
606	1 ☐	2 ☐	3 ☐

[If No, Skip to Item 139, Page 35]

DEMO - ROLLOVER OR NEW ADMIT

FEVER EPISODE NUMBER THREE

131. Was there an oral (or equivalent rectal) temperature greater than 100° F or 37.7° C for 12 hours or more?

607 1 ☐ YES → 2 ☐ NO

132. Was MD/NP/PA notified within 12 hours after the pattern was established?

	YES	NO
608	1 ☐	2 ☐

133. Is there a record of a chest examination for breath sounds?

609 1 ☐ 2 ☐

134. Is there record of a chest X-ray ordered?

610 1 ☐ 2 ☐

135. Was there a urinalysis ordered?

611 1 ☐ 2 ☐

136. Is there a record of antibiotics being prescribed?

612 1 ☐ 2 ☐

137. Was hydration increased or a note written to explain why not?

613 1 ☐ 2 ☐

138. What was the outcome?

	IMPROVED	WORSENED/ HOSPITALIZED	DIED
614	1 ☐	2 ☐	3 ☐

[If No, Skip to Item 139, Page 35]

DEMO - ROLLOVER OR NEW ADMIT

URINARY INCONTINENCE

139 Is there a diagnosis of urinary incontinence or a nurse's note about a problem of urinary accidents, bedwetting, et cetera.

615 1 ☐ YES → 140. Was there an episode of urinary incontinence in a previously continent resident?

2 ☐ NO

616 1 ☐ YES → 141. Was an MD/NP/PA notified within 24 hours?

	YES	NO
617	1 ☐	2 ☐

142. Was a urinalysis ordered?

618 1 ☐ 2 ☐

143. Was a urine culture ordered?

619 1 ☐ 2 ☐

2 ☐ NO

144. Is there evidence of a chronic problem of urinary incontinece?

620 1 ☐ YES → 145. Was problem evaluated by a physician or referred to a urologist?

	YES	NO, PREVIOUSLY EVALUATED	NO, NEVER EVALUATED
621	1 ☐	2 ☐	3 ☐

2 ☐ NO

[IF NO, SKIP TO ITEM 150, PAGE 36]

146. If chronic incontinence, is resident cognitively impaired or bedfast?

622 1 ☐ YES → [IF YES, SKIP TO ITEM 150, PAGE 36]

2 ☐ NO → 147. Was resident encouraged to use bathroom or was urinal at bedside?

	YES	NO
623	1 ☐	2 ☐

148. Is there evidence of an effort at bladder training or scheduled toileting?

624 1 ☐ 2 ☐

149 Was resident maintained on an indwelling catheter for more than 2 weeks?

625 1 ☐ 2 ☐

[If No, Skip to Item 150, Page 36]

DEMO - ROLLOVER OR NEW ADMIT

FEEDING

150 Is there an indication in the nurse's notes that the resident ever needed to be fed?

626 1 ☐ YES → 151. Is there a care plan to encourage resident to feed self?

1 ☐ YES

627 2 ☐ NO

152. Has the resident been enrolled in a program to train or encourage self-feeding?

1 ☐ YES

628 2 ☐ NO

153. Does the resident improve feeding ability?

1 ☐ YES, feeds self

629 2 ☐ YES, still requires assistance

3 ☐ NO

2 ☐ NO

[If No, Skip to Item 154, Page 37]

DEMO - ROLLOVER OR NEW ADMIT

CONFUSION

154. Is there any indication in the nurse's notes that the resident who was NOT previously confused experienced sustained confusion (noted by 3 out of 5 consecutive shifts)?

630

1 ☐ YES → WERE ANY OF THE FOLLOWING EVALUATIONS DONE TO DETERMINE CAUSE OF CONFUSION?

2 ☐ NO

		YES	NO
155.	Neurologic evaluation ——— 631	1 ☐	2 ☐
156.	Psychiatric consultation ——— 632	1 ☐	2 ☐
157.	CT Scan ——— 633	1 ☐	2 ☐
158.	Electrolytes checked (Na^+ and K^+) ——— 634	1 ☐	2 ☐
159.	Blood sugar checked ——— 635	1 ☐	2 ☐
160.	Thyroid test ——— 636	1 ☐	2 ☐
161.	Evaluation of drug regimen ——— 637	1 ☐	2 ☐
162.	Vital signs taken within 2 hours of first bout of confusion ——— 638	1 ☐	2 ☐

[Skip to FORM 04, Page 38]

[If No, Skip to FORM 04, Page 38]

LABEL

Record 01
12

Idcode
14 29

FUNCTIONAL STATUS

FORM 04

PERIOD A-PERIOD B-PERIOD C

ROLLOVERS AND NEW ADMITS

FUNCTIONAL STATUS

FORM 04

PERIOD A

30 MO DA YR [ ][ ] [ ][ ] [ ][ ] TO 36 MO DA YR [ ][ ] [ ][ ] [ ][ ]

[Copy Date 8a from Worksheet] [Copy Date 8b from Worksheet]

FROM THE NURSE'S NOTES AND THE NURSING AIDE'S NOTES, WHAT IS THE MOST FREQUENTLY DOCUMENTED FUNCTIONAL STATUS DURING THE TWO WEEK INTERVAL WITH RESPECT TO

1. Ambulation/Mobility

42
- 1 ☐ Bedfast
- 2 ☐ Wheelchair/Chair Bound
- 3 ☐ Walks; Requires Human Assistance
- 4 ☐ Walks; Independent Using Adaptive Device
- 5 ☐ Walks; Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

2. Transferring

43
- 1 ☐ Bedfast - No Transferring
- 2 ☐ Requires Human and/or Mechanical Assistance
- 3 ☐ Needs Guidance or Standby Assistance
- 4 ☐ Independent; Requires Adaptive Device
- 5 ☐ Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

3 Feeding/Eating

44
- 1 ☐ Tube Feeding
- 2 ☐ Completely Fed by Staff
- 3 ☐ Feeds Self; Requires Help/Supervision of Staff
- 4 ☐ Feeds Self; Requires Preparation of Food by Staff
- 5 ☐ Feeds Self; Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

PERIOD A - FUNCTIONAL STATUS - CONTINUED

4 Toileting - Bladder

1 ☐ Catheterized/Ostomy
2 ☐ Incontinent Bladder; External Catheter
45 3 ☐ Occasional/Nocturnal Incontinence
4 ☐ Continent
8 ☐ NO RECORD OR UNABLE TO DETERMINE

5 Toileting - Bowel

1 ☐ Ostomy
2 ☐ Bowel Incontinence
46 3 ☐ Occasional Bowel Incontinence
4 ☐ Continent
8 ☐ NO RECORD OR UNABLE TO DETERMINE

6 Dressing

1 ☐ Never Dressed
2 ☐ Dressed Completely by Staff
3 ☐ Requires Aid of Staff; Performs at Least Half the Effort
47 4 ☐ Independent with Programming or Supervision
5 ☐ Independent; Requires Adaptive Device(s)
6 ☐ Independent
8 ☐ NO RECORD OR UNABLE TO DETERMINE

7 Level of Consciousness

1 ☐ Comatose ▶ [IF COMATOSE SKIP TO DATES, PAGE 42]
2 ☐ Semi-Alert
48
3 ☐ Alert
8 ☐ NO RECORD OR UNABLE TO DETERMINE

PERIOD A - FUNCTIONAL STATUS - CONTINUED

8 Mental Status

49

1 ☐ Confused and Disoriented
2 ☐ Frequently Confused and Disoriented
3 ☐ Occassionally Confused and Disoriented
4 ☐ Fully Oriented
8 ☐ NO RECORD OR UNABLE TO DETERMINE

9 Behavior

50

1 ☐ Frequently Disruptive/Wandering/Combative
2 ☐ Occassionally Disruptive/Wandering/Combative
3 ☐ No Problems
4 ☐ NO RECORD OR UNABLE TO DETERMINE

FUNCTIONAL STATUS - CONTINUED

PERIOD B

	MO	DA	YR		MO	DA	YR
51				TO			
	[Copy Date 9a from Worksheet]				[Copy Date 9b from Worksheet]		

FROM THE NURSE'S NOTES AND THE NURSING AIDE'S NOTES, WHAT IS THE MOST FREQUENTLY DOCUMENTED FUNCTIONAL STATUS DURING THE TWO WEEK INTERVAL WITH RESPECT TO

10 Ambulation/Mobility

63
- 1 ☐ Bedfast
- 2 ☐ Wheelchair/Chair Bound
- 3 ☐ Walks; Requires Human Assistance
- 4 ☐ Walks; Independent Using Adaptive Device
- 5 ☐ Walks; Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

11 Transferring

64
- 1 ☐ Bedfast - No Transferring
- 2 ☐ Requires Human and/or Mechanical Assistance
- 3 ☐ Needs Guidance or Standby Assistance
- 4 ☐ Independent; Requires Adaptive Device
- 5 ☐ Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

12 Feeding/Eating

65
- 1 ☐ Tube Feeding
- 2 ☐ Completely Fed by Staff
- 3 ☐ Feeds Self; Requires Help/Supervision of Staff
- 4 ☐ Feeds Self; Requires Preparation of Food by Staff
- 5 ☐ Feeds Self; Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

13 Toileting - Bladder

66
- 1 ☐ Catheterized/Ostomy
- 2 ☐ Incontinent Bladder; External Catheter
- 3 ☐ Occasional/Nocturnal Incontinence
- 4 ☐ Continent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

PERIOD B - FUNCTIONAL STATUS - CONTINUED

14. Toileting - Bowel

67

1 ☐ Ostomy
2 ☐ Bowel Incontinence
3 ☐ Occasional Bowel Incontinence
4 ☐ Continent
8 ☐ NO RECORD OR UNABLE TO DETERMINE

15. Dressing

68

1 ☐ Never Dressed
2 ☐ Dressed Completely by Staff
3 ☐ Requires Aid of Staff; Performs at Least Half the Effort
4 ☐ Independent with Programming or Supervision
5 ☐ Independent; Requires Adaptive Device(s)
6 ☐ Independent
8 ☐ NO RECORD OR UNABLE TO DETERMINE

16. Level of Consciousness

69

1 ☐ Comatose → [IF COMATOSE SKIP TO DATES, PAGE 44]
2 ☐ Semi-Alert
3 ☐ Alert
8 ☐ NO RECORD OR UNABLE TO DETERMINE

17. Mental Status

70

1 ☐ Confused and Disoriented
2 ☐ Frequently Confused and Disoriented
3 ☐ Occassionally Confused and Disoriented
4 ☐ Fully Oriented
8 ☐ NO RECORD OR UNABLE TO DETERMINE

18. Behavior

71

1 ☐ Frequently Disruptive/Wandering/Combative
2 ☐ Occassionally Disruptive/Wandering/Combative
3 ☐ No Problems
8 ☐ NO RECORD OR UNABLE TO DETERMINE

FUNCTIONAL STATUS - CONTINUED

PERIOD C

	MO	DA	YR		TO	MO	DA	YR
72					78			
	[Copy Date10a from Worksheet]					[Copy Date 10b from Worksheet]		

FROM THE NURSE'S NOTES AND THE NURSING AIDE'S NOTES, WHAT IS THE MOST FREQUENTLY DOCUMENTED FUNCTIONAL STATUS DURING THE TWO WEEK INTERVAL WITH RESPECT TO

19 Ambulation/Mobility

84
- 1 ☐ Bedfast
- 2 ☐ Wheelchair/Chair Bound
- 3 ☐ Walks; Requires Human Assistance
- 4 ☐ Walks; Independent Using Adaptive Device
- 5 ☐ Walks; Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

20 Transferring

85
- 1 ☐ Bedfast - No Transferring
- 2 ☐ Requires Human and/or Mechanical Assistance
- 3 ☐ Needs Guidance or Standby Assistance
- 4 ☐ Independent; Requires Adaptive Device
- 5 ☐ Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

21 Feeding/Eating

86
- 1 ☐ Tube Feeding
- 2 ☐ Completely Fed by Staff
- 3 ☐ Feeds Self; Requires Help/Supervision of Staff
- 4 ☐ Feeds Self; Requires Preparation of Food by Staff
- 5 ☐ Feeds Self, Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

22 Toileting - Bladder

87
- 1 ☐ Catheterized/Ostomy
- 2 ☐ Incontinent Bladder; External Catheter
- 3 ☐ Occasional/Nocturnal Incontinence
- 4 ☐ Continent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

PERIOD C - FUNCTIONAL STATUS - CONTINUED

23 Toileting - Bowel

88
- 1 ☐ Ostomy
- 2 ☐ Bowel Incontinence
- 3 ☐ Occasional Bowel Incontinence
- 4 ☐ Continent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

24 Dressing

89
- 1 ☐ Never Dressed
- 2 ☐ Dressed Completely by Staff
- 3 ☐ Requires Aid of Staff; Performs at Least Half the Effort
- 4 ☐ Independent with Programming or Supervision
- 5 ☐ Independent; Requires Adaptive Device(s)
- 6 ☐ Independent
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

25 Level of Consciousness

90
- 1 ☐ Comatose ▶ [IF COMATOSE, SKIP TO FORM 05, PAGE 46]
- 2 ☐ Semi-Alert
- 3 ☐ Alert
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

26 Mental Status

91
- 1 ☐ Confused and Disoriented
- 2 ☐ Frequently Confused and Disoriented
- 3 ☐ Occassionally Confused and Disoriented
- 4 ☐ Fully Oriented
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

27 Behavior

92
- 1 ☐ Frequently Disruptive/Wandering/Combative
- 2 ☐ Occassionally Disruptive/Wandering/Combative
- 3 ☐ No Problems
- 8 ☐ NO RECORD OR UNABLE TO DETERMINE

[Skip to FORM 05, Page 43]

NURSING TREATMENTS

FORM 05

PERIOD A-PERIOD B-PERIOD C

F. 'LLOVERS AND NEW ADMITS

NURSING TREATMENTS

FORM 05

PERIOD A

	MO	DA	YR	TO	MO	DA	YR
93	☐☐	☐☐	☐☐		99 ☐☐	☐☐	☐☐
	[Copy Date 8a from Worksheet]				[Copy Date 8b from Worksheet]		

HAS THE RESIDENT RECEIVED ANY OF THE FOLLOWING NURSING TREATMENTS DURING PERIOD A?

			YES	NO
1	Skin Care - [Other than Decubiti] Prevention and/or Treatment	105	1 ☐	2 ☐
2	Prevention of Decubiti	106	1 ☐	2 ☐
3	Treatment of Decubiti	107	1 ☐	2 ☐
4	Wound Care	108	1 ☐	2 ☐
5	Indwelling/Suprapubic Catheter	109	1 ☐	2 ☐
6	Bladder Training Program	110	1 ☐	2 ☐
7	Bowel Training	111	1 ☐	2 ☐
8	Gait Training Other Than Physical Therapy	112	1 ☐	2 ☐
9	Range of Motion by Nurse	113	1 ☐	2 ☐
10	Restorative Nursing	114	1 ☐	2 ☐
11	Physical Restraints	115	1 ☐	2 ☐
12	Prothesis Care	116	1 ☐	2 ☐
13	Tracheostomy Care	117	1 ☐	2 ☐
14	Oxygen or Respiratory Therapy	118	1 ☐	2 ☐
15	Oral Suctioning	119	1 ☐	2 ☐
16	Regulation and Management of I.V. Fluid or Therapy	120	1 ☐	2 ☐
17	Tube Feeding/Care	121	1 ☐	2 ☐
18	Gastrostomy/Colostomy/Ileostomy Care	122	1 ☐	2 ☐
19	Pureed Diets	123	1 ☐	2 ☐

NURSING TREATMENTS - CONTINUED

PERIOD B

	MO	DA	YR	TO	MO	DA	YR
129				130			
	[Copy Date 9a from Worksheet]				[Copy Date 9b from Worksheet]		

HAS THE RESIDENT RECEIVED ANY OF THE FOLLOWING NURSING TREATMENTS DURING PERIOD B?

			YES	NO
20	Skin Care - [Other than Decubiti] Prevention and/or Treatment	136	1 ☐	2 ☐
21	Prevention of Decubiti	137	1 ☐	2 ☐
22	Treatment of Decubiti	138	1 ☐	2 ☐
23	Wound Care	139	1 ☐	2 ☐
24	Indwelling/Suprapubic Catheter	140	1 ☐	2 ☐
25	Bladder Training Program	141	1 ☐	2 ☐
26	Bowel Training	142	1 ☐	2 ☐
27	Gait Training Other Than Physical Therapy	143	1 ☐	2 ☐
28	Range of Motion by Nurse	144	1 ☐	2 ☐
29	Restorative Nursing	145	1 ☐	2 ☐
30	Physical Restraints	146	1 ☐	2 ☐
31	Prothesis Care	147	1 ☐	2 ☐
32	Tracheostomy Care	148	1 ☐	2 ☐
33	Oxygen or Respiratory Therapy	149	1 ☐	2 ☐
34	Oral Suctioning	150	1 ☐	2 ☐
35	Regulation and Management of I.V. Fluid or Therapy	151	1 ☐	2 ☐
36	Tube Feeding/Care	152	1 ☐	2 ☐
37	Gastrostomy/Colostomy/Ileostomy Care	153	1 ☐	2 ☐
38	Pureed Diets	154	1 ☐	2 ☐

NURSING TREATMENTS - CONTINUED

PERIOD C

155 MO ☐☐ DA ☐☐ YR ☐☐ TO 161 MO ☐☐ DA ☐☐ YR ☐☐

[Copy Date 10a from Worksheet] [Copy Date 10b from Worksheet]

HAS THE RESIDENT RECEIVED ANY OF THE FOLLOWING NURSING TREATMENTS DURING PERIOD C?

			YES	NO
39.	Skin Care - [Other than Decubiti] Prevention and/or Treatment	167	1 ☐	2 ☐
40.	Prevention of Decubiti	168	1 ☐	2 ☐
41.	Treatment of Decubiti	169	1 ☐	2 ☐
42.	Wound Care	170	1 ☐	2 ☐
43.	Indwelling/Suprapubic Catheter	171	1 ☐	2 ☐
44.	Bladder Training Program	172	1 ☐	2 ☐
45.	Bowel Training	173	1 ☐	2 ☐
46.	Gait Training Other Than Physical Therapy	174	1 ☐	2 ☐
47.	Range of Motion by Nurse	175	1 ☐	2 ☐
48.	Restorative Nursing	176	1 ☐	2 ☐
49.	Physical Restraints	177	1 ☐	2 ☐
50.	Prothesis Care	178	1 ☐	2 ☐
51.	Tracheostomy Care	179	1 ☐	2 ☐
52.	Oxygen or Respiratory Therapy	180	1 ☐	2 ☐
53.	Oral Suctioning	181	1 ☐	2 ☐
54.	Regulation and Management of I.V. Fluid or Therapy	182	1 ☐	2 ☐
55.	Tube Feeding/Care	183	1 ☐	2 ☐
56.	Gastrostomy/Colostomy/Ileostomy Care	184	1 ☐	2 ☐
57.	Pureed Diets	185	1 ☐	2 ☐

[Skip to FORM 06, Page 50]

MEDICATION RECORD

FORM 06

PERIOD A-PERIOD B-PERIOD C

ROLLOVERS AND NEW ADMITS

MEDICATION RECORD

FORM 07

PERIOD A

186 MO ☐☐ DA ☐☐ YR ☐☐ TO 192 MO ☐☐ DA ☐☐ YR ☐☐

[Copy Date 8a from Worksheet] [Copy Date 8b from Worksheet]

PSYCHOTROPICS (NEUROLEPTICS)

1 Were any of the following medications administered: Mellaril/Mellaril S, Thorazine, Chlorpromazine, or Thioridazine? [Dose range: 10mg to 200 mg]

198 1 ☐ YES → 2 ☐ NO

a Regular Dosage 199 ☐☐☐ mg

b Number of Doses 202 ☐☐

c prn Dosage 1 204 ☐☐☐ mg

d Number of Doses 207 ☐☐

e prn Dosage 2 209 ☐☐☐ mg

f Number of Doses 212 ☐☐

g prn Dosage 3 214 ☐☐☐ mg

h Number of Doses 217 ☐☐

2 Was the following medication administered: Haldol (Haloperidol)? [Dose range: 0.5 mg to 5 0mg]

219 1 ☐ YES → 2 ☐ NO

a Regular Dosage 220 ☐.☐ mg

b Number of Doses 222 ☐☐

c prn Dosage 1 224 ☐.☐ mg

d Number of Doses 226 ☐☐

PERIOD A - MEDICATION RECORD - CONTINUED

SEDATIVE/HYPNOTIC

3 Was the following medication administered: Xanax (Alprazolam)? [Dose range: 0.25 mg to 1.0 mg]

228 1 ☐ YES → a. Regular Dosage 229 ☐☐.☐☐ mg; b. Number of Doses 232 ☐☐; c. prn Dosage 1 234 ☐☐.☐☐ mg; d. Number of Doses 237 ☐☐

2 ☐ NO

4 Was the following medication administered: Tranxene (Chlorazepate)? [Dose range: 3.75 mg to 22.5 mg]

239 1 ☐ YES → a. Regular Dosage 240 ☐☐.☐☐ mg; b. Number of Doses 244 ☐☐; c. prn Dosage 1: 246 ☐☐.☐☐ mg; d. Number of Doses 250 ☐☐

2 ☐ NO

5 Was the following medication administered: Librium (Chlordiazepoxide)? [Dose range: 5 mg to 25 mg]

252 1 ☐ YES → a. Regular Dosage 253 ☐☐ mg; b. Number of Doses 255 ☐☐; c. prn Dosage 1: 257 ☐☐ mg; d. Number of Doses 259 ☐☐

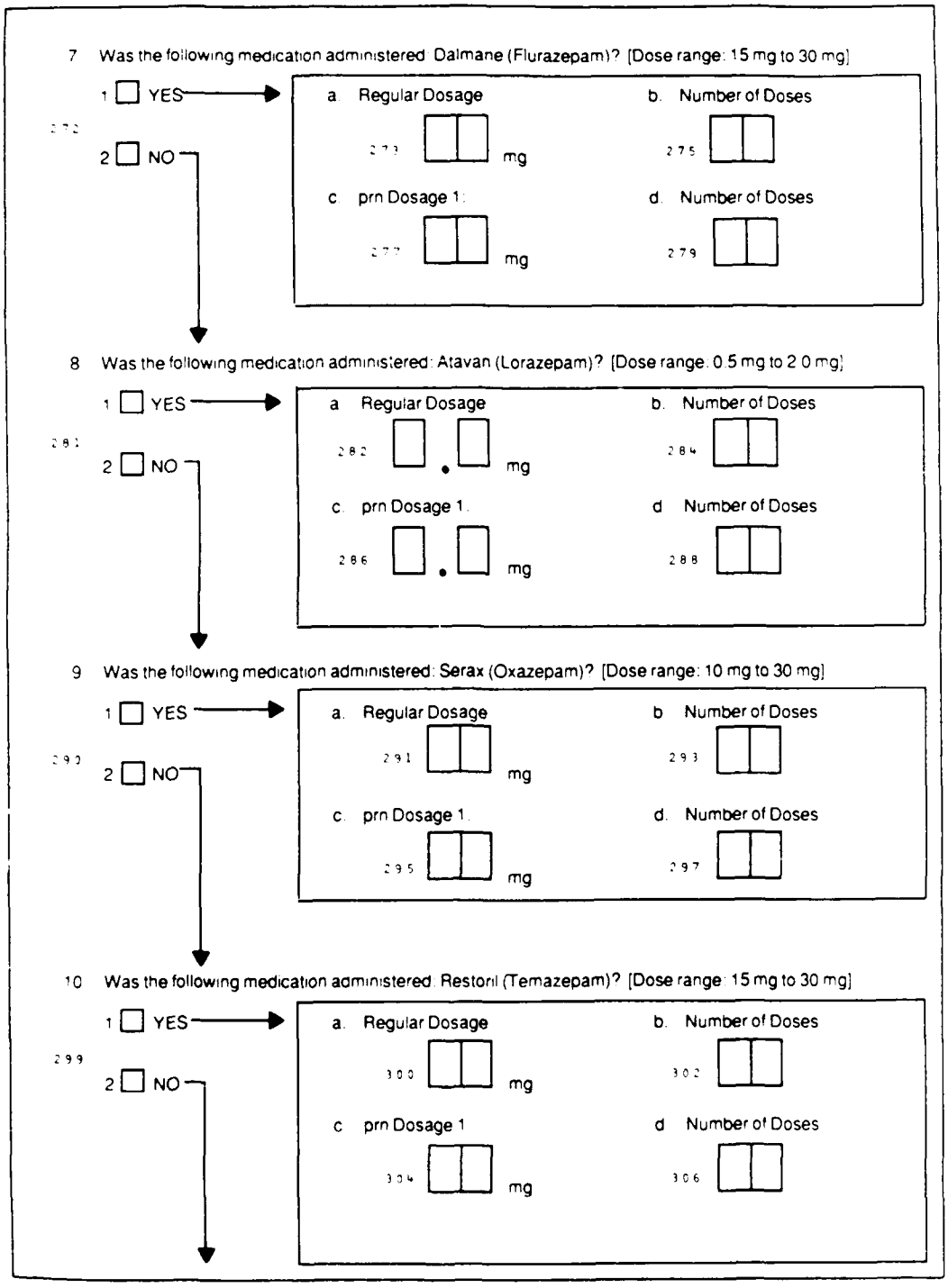
2 ☐ NO

6 Was the following medication administered: Valium (Diazepam)? [Dose range: 2mg to 10 mg]

261 1 ☐ YES → a. Regular Dosage 262 ☐☐.☐ mg; b. Number of Doses 265 ☐☐; c. prn Dosage 1 267 ☐☐.☐ mg; d. Number of Doses 270 ☐☐

2 ☐ NO

PERIOD A - MEDICATION RECORD - CONTINUED



PERIOD A - MEDICATION RECORD - CONTINUED

11 Was the following medication administered: Halcion (Triazolan)? [Dose range: 0.125 mg to 0.5 mg]

1 ☐ YES → a. Regular Dosage • ☐☐☐ mg (309) b. Number of Doses ☐☐ (312)
c. prn Dosage 1: • ☐☐☐ mg (314) d. Number of Doses ☐☐ (317)

309 2 ☐ NO

ANTI-DEPRESSANTS (TRICYCLICS)

12 Were any of the following medications administered: Elavil/Endep (Amitriptyline); Senequan/Adapin (Doxepin); or Tofranil/Janimine (Imiprimine)? [Dose range: 10 mg to 150 mg]

1 ☐ YES → a. Regular Dosage 320 ☐☐☐ mg b. Number of Doses 323 ☐☐
c. *prn Dosage 1*: 325 ☐☐☐ mg d. Number of Doses 328 ☐☐
e. prn Dosage 2: 330 ☐☐☐ mg f. Number of Doses 333 ☐☐
g. prn Dosage 3: 335 ☐☐☐ mg h. Number of Doses 338 ☐☐

319 2 ☐ NO

DIGOXIN (DG)

13 Were any of the following medications administered: Lanoxin or Lanoxicaps? [Note: Lanoxicaps 0.1 mg = Lanoxin 0.125mg]

1 ☐ YES → a. Regular Dosage 1 • ☐☐☐ mg (341) b. Number of Doses ☐☐ (344)
c. Regular Dosage 2: • ☐☐☐ mg (346) d Number of Doses ☐☐ (349)

340 2 ☐ NO

PERIOD A - MEDICATION RECORD - CONTINUED

DIURETICS

14 Were any of the following medications administered: Hydrodiuril (Hydrochlorothiazide) or Dyazide? [Note: Dyazide 1 tab = 50 mg]

351 1 ☐ YES → a. Regular Dosage 1: 352 ☐☐ mg b. Number of Doses 354 ☐☐

2 ☐ NO → c. Regular Dosage 2: 356 ☐☐ mg d. Number of Doses 358 ☐☐

LASIX

15 Was the following medication administered: Lasix? [Dosage: 40 mg]

360 1 ☐ YES → a. Regular Dosage 1: 361 ☐☐ mg b. Number of Doses 363 ☐☐

2 ☐ NO → c. Regular Dosage 2: 365 ☐☐ mg d. Number of Doses 367 ☐☐

OTHER

MEDICATION NAME	DOSE	NUMBER OF DOSES

[SKIP TO PERIOD B, PAGE 56]

MEDICATION RECORD - CONTINUED

PERIOD B

369 MO DA YR [Copy Date 9a from Worksheet] TO 375 MO DA YR [Copy Date 9b from Worksheet]

PSYCHOTROPICS (NEUROLEPTICS)

376 Were any of the following medications administered: Mellaril/Mellaril S, Thorazine, Chlorpromazine, or Thioridazine? [Dose range: 10 mg to 200 mg]

381 1 ☐ YES → 2 ☐ NO

a. Regular Dosage 382 ☐☐☐ mg
b. Number of Doses 385 ☐☐
c. prn Dosage 1 388 ☐☐☐ mg
d. Number of Doses 391 ☐☐
e. prn Dosage 2 393 ☐☐☐ mg
f. Number of Doses 396 ☐☐
g. prn Dosage 3 398 ☐☐☐ mg
h. Number of Doses 401 ☐☐

403 17 Was the following medication administered: Haldol (Haloperidol)? [Dose range: 0.5 mg to 5.0mg]

1 ☐ YES → 2 ☐ NO

a. Regular Dosage 404 ☐.☐ mg
b. Number of Doses 406 ☐☐
c. prn Dosage 1 408 ☐.☐ mg
d. Number of Doses 410 ☐☐

PERIOD B - MEDICATION RECORD - CONTINUED

SEDATIVE/HYPNOTICS

18 Was the following medication administered: Xanax (Alprazolam)? [Dose range: 0.25 mg to 1 0 mg]

412 1 ☐ YES → a. Regular Dosage 413 ☐☐.☐☐ mg; b. Number of Doses 416 ☐☐; c. prn Dosage 1 418 ☐☐.☐☐ mg; d. Number of Doses 421 ☐☐

2 ☐ NO

19 Was the following medication administered: Tranxene (Chlorazepate)? [Dose range: 3.75 mg to 22 5 mg]

423 1 ☐ YES → a. Regular Dosage 424 ☐☐.☐☐ mg; b. Number of Doses 428 ☐☐; c. prn Dosage 1: 430 ☐☐.☐☐ mg; d. Number of Doses 434 ☐☐

2 ☐ NO

20. Was the following medication administered: Librium (Chlordiazepoxide)? [Dose range: 5 mg to 25 mg]

436 1 ☐ YES → a. Regular Dosage 437 ☐☐ mg; b. Number of Doses 439 ☐☐; c. prn Dosage 1: 441 ☐☐ mg; d. Number of Doses 443 ☐☐

2 ☐ NO

21 Was the following medication administered: Valium (Diazepam)? [Dose range: 2 mg to 10 mg]

445 1 ☐ YES → a. Regular Dosage 446 ☐☐.☐ mg; b. Number of Doses 449 ☐☐; c. prn Dosage 1: 451 ☐☐.☐ mg; d Number of Doses 454 ☐☐

2 ☐ NO

PERIOD B - MEDICATION RECORD - CONTINUED

22 Was the following medication administered: Dalmane (Flurazepam)? [Dose range: 15 mg to 30 mg]

456 1 ☐ YES → a. Regular Dosage 457 ☐☐ mg; b. Number of Doses 459 ☐☐; c. prn Dosage 1: 461 ☐☐ mg; d. Number of Doses 463 ☐☐

2 ☐ NO

23 Was the following medication administered: Atavan (Lorazepam)? [Dose range: 0.5 mg to 2.0 mg]

465 1 ☐ YES → a. Regular Dosage 466 ☐.☐ mg; b. Number of Doses 468 ☐☐; c. prn Dosage 1: 470 ☐.☐ mg; d. Number of Doses 472 ☐☐

2 ☐ NO

24 Was the following medication administered: Serax (Oxazepam)? [Dose range: 10 mg to 30 mg]

474 1 ☐ YES → a. Regular Dosage 475 ☐☐ mg; b. Number of Doses 477 ☐☐; c. prn Dosage 1: 479 ☐☐ mg; d. Number of Doses 481 ☐☐

2 ☐ NO

25 Was the following medication administered: Restoril (Temazepam)? [Dose range: 15 mg to 30 mg]

483 1 ☐ YES → a. Regular Dosage 484 ☐☐ mg; b. Number of Doses 486 ☐☐; c. prn Dosage 1: 488 ☐☐ mg; d. Number of Doses 490 ☐☐

2 ☐ NO

PERIOD B - MEDICATION RECORD - CONTINUED

26 Was the following medication administered: Halcion (Triazolan)? [Dose range: 0.125 mg to 0.5 mg]

1 ☐ YES → a. Regular Dosage ____ mg; b. Number of Doses ____; c. prn Dosage 1 ____ mg; d. Number of Doses ____

2 ☐ NO

ANTI-DEPRESSANTS (TRICYCLICS)

27 Were any of the following medications administered: Elavil/Endep (Amitriptyline), Sinequan/Adapin (Doxepin), or Tofranil/Janimine (Imipramine)? [Dose range: 10 mg to 150 mg]

1 ☐ YES → a. Regular Dosage ____ mg; b. Number of Doses ____; c. prn Dosage 1 ____ mg; d. Number of Doses ____; e. prn Dosage 2 ____ mg; f. Number of Doses ____; g. prn Dosage 3 ____ mg; h. Number of Doses ____

2 ☐ NO

DIGOXIN (DG)

28 Were any of the following medications administered: Lanoxin or Lanoxicaps? [Note: Lanoxicaps 0.1 mg = Lanoxin 0.125 mg]

1 ☐ YES → a. Regular Dosage 1 ____ mg; b. Number of Doses ____; c. Regular Dosage 2 ____ mg; d. Number of Doses ____

2 ☐ NO

PERIOD B - MEDICATION RECORD - CONTINUED

DIURETICS

29 Were any of the following medications administered: Hydrodiuril (Hydrochlorothiazide) or Dyazide? [Note: Dyazide 1 tab = 50 mg]

535

1 ☐ YES → a. Regular Dosage 1: 536 ☐☐ mg b. Number of Doses 538 ☐☐

2 ☐ NO → c. Regular Dosage 2: 540 ☐☐ mg d. Number of Doses 542 ☐☐

LASIX

30 Was the following medication administered: Lasix? [Dosage: 40 mg]

544

1 ☐ YES → a. Regular Dosage 1: 545 ☐☐ mg b. Number of Doses 547 ☐☐

2 ☐ NO → c. Regular Dosage 2: 549 ☐☐ mg d. Number of Doses 551 ☐☐

OTHER

MEDICATION NAME	DOSE	NUMBER OF DOSES

[SKIP TO PERIOD C, PAGE 61]

MEDICATION RECORD - CONTINUED

PERIOD C

	MO	DA	YR	TO	MO	DA	YR
553	☐☐	☐☐	☐☐		559 ☐☐	☐☐	☐☐
	[Copy Date10a from Worksheet]				[Copy Date 10b from Worksheet]		

PSYCHOTROPICS (NEUROLEPTICS)

31 Were any of the following medications administered: Mellaril/Mellaril S, Thorazine, Chlorpromazine, or Thioridazine? [Dose range: 10 mg to 200 mg]

575 1 ☐ YES → 2 ☐ NO

a Regular Dosage	566 ☐☐☐ mg	b. Number of Doses	569 ☐☐
c prn Dosage 1:	571 ☐☐☐ mg	d. Number of Doses	574 ☐☐
e prn Dosage 2:	576 ☐☐☐ mg	f. Number of Doses	579 ☐☐
g prn Dosage 3:	581 ☐☐☐ mg	h. Number of Doses	584 ☐☐

32 Was the following medication administered: Haldol (Haloperidol)? [Dose range: 0.5 mg to 5.0 mg]

5 1 ☐ YES → 2 ☐ NO

a Regular Dosage	587 ☐.☐ mg	b. Number of Doses	589 ☐☐
c prn Dosage 1	591 ☐.☐ mg	d. Number of Doses	593 ☐☐

PERIOD C - MEDICATION RECORD - CONTINUED

SEDATIVE/HYPNOTICS

33 Was the following medication administered: Xanax (Alprazolam)? [Dose range: 0.25 mg to 1.0 mg]

1 ☐ YES → a. Regular Dosage ☐☐.☐☐ mg (596) b. Number of Doses ☐☐ (599)
c. prn Dosage 1: ☐☐.☐☐ mg (601) d. Number of Doses ☐☐ (609)

2 ☐ NO

34 Was the following medication administered: Tranxene (Chlorazepate)? [Dose range: 3.75 mg to 22.5 mg]

1 ☐ YES → a. Regular Dosage ☐☐.☐☐ mg (607) b. Number of Doses ☐☐ (611)
c. prn Dosage 1: ☐☐.☐☐ mg (613) d. Number of Doses ☐☐ (617)

2 ☐ NO

35 Was the following medication administered: Librium (Chlordiazepoxide)? [Dose range: 5 mg to 25 mg]

1 ☐ YES → a. Regular Dosage ☐☐.☐☐ mg (620) b. Number of Doses ☐☐ (622)
c. prn Dosage 1: ☐☐.☐☐ mg (624) d. Number of Doses ☐☐ (626)

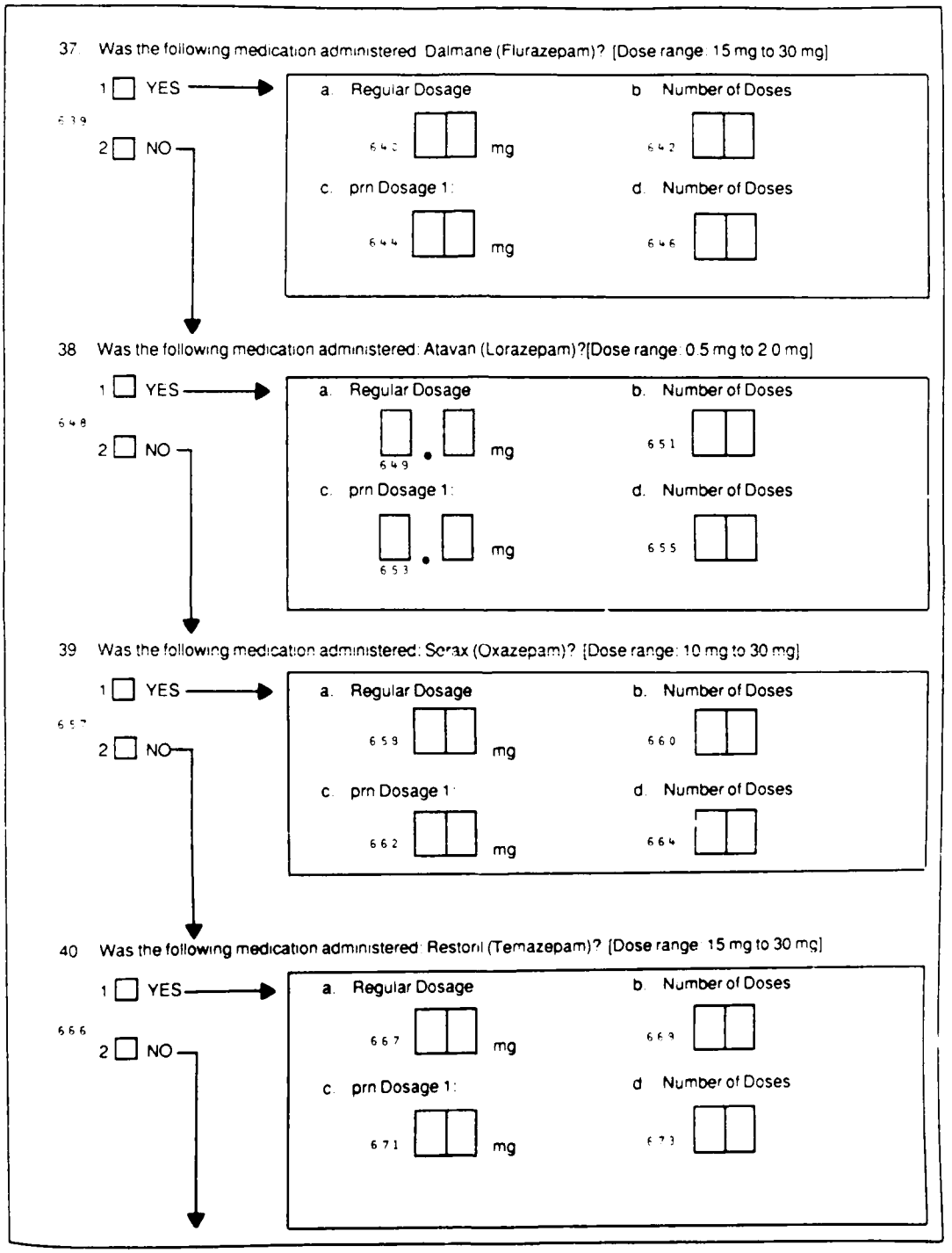
2 ☐ NO

36 Was the following medication administered: Valium (Diazepam)? [Dose range: 2 mg to 10 mg]

1 ☐ YES → a. Regular Dosage ☐☐.☐ mg (629) b. Number of Doses ☐☐ (632)
c. prn Dosage 1: ☐☐.☐ mg (634) d. Number of Doses ☐☐ (637)

2 ☐ NO

PERIOD C - MEDICATION RECORD - CONTINUED



PERIOD C - MEDICATION RECORD - CONTINUED

41 Was the following medication administered: Halcion (Triazolan)? [Dose range: 0.125 mg to 0.5 mg]

675 1 ☐ YES → a. Regular Dosage • 676 ☐☐☐ mg; b. Number of Doses 679 ☐☐

2 ☐ NO

c. prn Dosage 1: • 681 ☐☐☐ mg; d. Number of Doses 684 ☐☐

ANTI-DEPRESSANTS (TRICYCLICS)

42 Were any of the following medications administered: Elavil/Endep (Amitriptyline); Senequan/Adapin (Doxepin); or Tofranil/Janimine (Imipramine)? [Dose range: 10 mg to 150 mg]

685 1 ☐ YES →

2 ☐ NO

a. Regular Dosage 687 ☐☐☐ mg; b. Number of Doses 690 ☐☐

c. prn Dosage 1: 692 ☐☐☐ mg; d. Number of Doses 695 ☐☐

e. prn Dosage 2: 697 ☐☐☐ mg; f. Number of Doses 700 ☐☐

g. prn Dosage 3: 702 ☐☐☐ mg; h. Number of Doses 705 ☐☐

DIGOXIN (DG)

43 Were any of the following medications administered: Lanoxin or Lanoxicaps? [Note: Lanoxicaps 0.1 mg = Lanoxin 0.125mg]

707 1 ☐ YES →

2 ☐ NO

a. Regular Dosage 1 • 708 ☐☐☐ mg; b. Number of Doses 711 ☐☐

c. Regular Dosage 2 • 713 ☐☐☐ mg; d. Number of Doses 716 ☐☐

PERIOD C - MEDICATION RECORD - CONTINUED

DIURETICS

44 Were any of the following medications administered: Hydrodiuril (Hydrochlorothiazide) or Dyazide? [Note: Dyazide 1 tab = 50 mg]

1 ☐ YES → a. Regular Dosage 1 ☐☐ mg; b. Number of Doses ☐☐; c. Regular Dosage 2 ☐☐ mg; d. Number of Doses ☐☐

2 ☐ NO

LASIX

45 Was the following medication administered: Lasix? [Dosage: 40 mg]

1 ☐ YES → a. Regular Dosage 1 ☐☐ mg; b. Number of Doses ☐☐; c. Regular Dosage 2 ☐☐ mg; d. Number of Doses ☐☐

2 ☐ NO

OTHER

MEDICATION NAME	DOSE	NUMBER OF DOSES

END OF ABSTRACT

Appendix B

CASEMIX MEASURES

FUNCTIONALLY RANKED EXPLANATORY DESIGNATIONS—FRED

The FRED casemix system uses information on functional status and behavioral problems (Morris et al., 1987). The functional component of FRED incorporates information on ambulation, feeding, dressing, and bladder and bowel incontinence to derive four functional indices: total dependence, relative dependence, relative independence, total independence. Scores on the four indices were combined to classify patients into seven functional groups. Behavioral information was used to further disaggregate patients into ten categories.

Classes one through seven indicate increasing nursing dependency without behavioral dependencies. Classes one and two are considered light nursing need, classes three and four are considered moderate nursing need, and classes five through seven correspond to heavy nursing need. Classes eight through ten represent patients who have mental and behavioral problems with light, moderate, and heavy nursing needs, respectively.

Our medical record data do not distinguish among behavioral problems in the exact manner described in the FRED coding, so it was necessary to modify the criteria slightly for classification into the behavior categories. It was also difficult to detect fine distinctions between levels of physical functioning from the medical record nursing notes, so we had to approximate the classifications for some of the index development. As a result, we were unable to draw careful distinctions among categories three, four, and five, in particular. Otherwise, our data reasonably approximate the distribution of patients across classes reported by the developers (Morris et al. 1987).

RESOURCE UTILIZATION GROUPS II—RUGs

In the construction of this casemix system, patients are first classified into one of five clinical groups (special care, rehabilitation, clinically complex, severe behavioral problems, and reduced physical functioning) using diagnostic and functional status information (Schneider et al., 1984; Cooney and Fries, 1985). Special care patients include those with multiple sclerosis, quadriplegia, coma, stage 4 decubiti, nasal-gastric feeding, parental feeding, and/or suctioning. Heavy rehabilitation patients receive physical or occupational therapy at least five times per week. Clinically complex patients have acute medical needs such as cerebral palsy, hemiplegia, and dehydration. Severe behavioral problems indicate patients who exhibit frequent acts of physical aggression, verbal abuse, or hallucinations. Patients who do not fall into any of these groups are placed in the reduced physical functioning group. Gradations within the five clinical groupings, differentiated by the extent of ADL dependency, produce a set of 16 refined classifications.

Our diagnostic data, abstracted from the nursing home charts using a modified version of the ICD-9 system, were often not specific enough for diagnostic classification into the clinically complex category, so several approximations were attempted. For example, we were unable to distinguish persons who were terminally ill, so all patients with cancer diagnoses that were considered "usually terminal" by the project physician were placed in this category. RUGs

guidelines classify patients who receive therapy at least five times a week into the rehabilitation category, but our data contained only the total number of therapy sessions and not the rate. To approximate this rule, we placed all patients into this category who received therapy services on at least half of their days at risk. Within the ADL scoring, we were unable to make fine distinctions about toileting abilities, so we were likely to underestimate a patient's ADL level. As a result, we could not classify any patients into two of the 16 groups (RUGs 8 and 16) with the highest ADL score (approximately 3 percent of all cases). Where the number of cases in a category was too small, we collapsed two categories for estimation (RUGs 10,11 and 14,15).

MINNESOTA CASEMIX SYSTEM

This system separates patients into 10 classes, using ADL level, nursing therapies, diagnosis, and behavioral status. Patients are first divided by ADL status (low, medium, and high dependencies), and within the ADL groupings by the use of special nursing services (e.g., tube feeding, oxygen, Foley catheter, ostomy care, decubitus care, 4 fluids, oral suction, and tracheostomy care) and the presence of behavioral problems. Within the high ADL grouping, certain neurological conditions define a fourth subgroup of cases.

BIBLIOGRAPHY

Arling, G., R. H. Nordquist, and J. A. Capitman, "Nursing Home Cost and Ownership Type: Evidence of Interaction Effects," *Health Services Research*, Vol. 22, No. 2, June 1987, pp. 255–269.

Arnett, R. H., D. R. McKusick, S. T. Sonnefeld, and C. S. Cowell, "Projections of Health Care Spending to 1990," *Health Care Financing Review*, Vol. 7, No. 3, Spring 1986, pp. 1–36.

Arnold, S., "Cost Based Reimbursement for Nursing Home Care," The RAND Corporation, P-7353-RGS, June 1987.

Beebe, J., J. Lubitz, and P. Eggers, "Using Prior Utilization to Determine Payments for Medicare Enrollees in Health Maintenance Organizations," *Health Care Financing Review*, Vol. 6, No. 3, Spring 1985, pp. 27–38.

Birnbaum, H. C., C. Bishop, G. Jensen, A. J. Lee, and D. Wilson, *Reimbursement Strategies for Nursing Home Care: Developmental Cost Studies,* Final Report to Health Care Financing Administration, Abt Associates, Inc., 1979.

Bishop, C., "Nursing Home Costs in Massachusetts," in Birnbaum, et al., 1979.

Bishop, C., "Nursing Home Costs Studies and Reimbursement Issues," *Health Care Financing Review*, Vol. 1, Spring 1980, pp. 47–64.

Buchanan, J. L. and S. Hosek, *Costs, Productivity, and the Utilization of Physician's Extenders in Air Force Primary Medicine Clinics*, R-2896-AF, The RAND Corporation, June 1983.

Buchanan, J. L., et al., *The Financial Impact of Nursing Home Based Geriatric Nurse Practitioners: An Evaluation of the Mountain States Health Corporation GNP Project,* The RAND Corporation, R-3694-HCFA/RWJ, May 1989a.

Buchanan, J. L., et al., *A Matched Sampling Algorithm for the Nursing Home Connection Demonstration*, The RAND Corporation, N-2823-HCFA, July 1989b.

Buchanan, J. L., et al., *Provider Visit Patterns to Nursing Home Patients*, The RAND Corporation, N-2824-HCFA, June 1989c.

Caswell, R. J. and W. O. Cleverley, "Cost Analysis of the Ohio Nursing Home Industry," *Health Services Research*, Vol. 18, No. 3, Fall 1983, pp. 359–382.

Chambers, D. B., B. A. Resnik, and C. E. Deitrich, *Final Report: University GNP Program Consortium Evaluation Project,* University of California, San Francisco, May 1988.

Congress of the United States, Office of Technology Assessment, Health Technology Case Study 37, "Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives: A Policy Analysis," Washington, D. C., December 1986.

Cooney, Leo M., Jr. and B. E. Fries, "Validation and Use of Resource Utilization Groups as a Case-mix Measure for Long-term Care," *Medical Care*, Vol. 23, No. 2, February 1985, pp. 123–132.

David, K., and P. Rowland, *Medicare Policy: New Directions for Health and Long-Term Care*, The Johns Hopkins University Press, Baltimore and London, 1986.

Deiner, C. H. (ed.), "Long-Term-Care Pharmacy Operations," in *Lilly Digest*, 1987, p. 200.

Duan, N. et al., *A Comparison of Alternative Models for the Demand for Medical Care*, The RAND Corporation, R-2754-HHS, January 1982.

Feldman, M. J., M. R. Ventura, and F. Crosby, "Studies of Nurse Practitioner Effectiveness," *Nursing Research*, Vol. 36, No. 95, October 1987, pp. 303–308.

Fries, B. E., and L.M. Cooney, "Resource Utilization Groups: A Patient Classification System for Long-Term Care," *Medical Care*, Vol. 23, No. 2, February 1985, pp. 110–118.

Gambert, S. R., W. E. Rosenkranz, S. N. Basu, K. E. Jewell, and E. R. Winga, "Role of the Physician Extender in the Long-Term Care Setting," *Wisconsin Medical Journal*, Vol. 82, September 1983, pp. 30–32.

General Accounting Office, Human Resources Division, "Medicaid: Interstate Variations in Benefits and Expenditures," GAO/HRD-87-67BR, Washington, D.C., May 1987.

Harrington, C., and J. H. Swan, "The Impact of State Medicaid Nursing Home Policies on Utilization and Expenditures," *Inquiry*, Vol. 24, Summer 1987, pp. 157–172.

Holahan, J., J. Cohen, and W. Scanlon, *Nursing Home Costs and Reimbursement Policy: Evidence from the 1977 National Home Survey*, Working Paper No. 1466-22 (Revised), The Urban Institute, Washington, D.C., July 1983.

Holahan, J., "State Rate-Setting and Its Effects on the Cost of Nursing-Home Care," *Journal of Health Politics, Policies and Law*, Vol. 9, No. 4, Winter 1985, pp. 647–667.

Howe, C., and R. Terrell, *Analysis of State Medicaid Program Characteristics, 1986*, Health Care Financing Administration, U.S. Department of Health and Human Services, Washington, D.C., August 1987.

Institute of Medicine, *Improving the Quality of Care in Nursing Homes*, National Academy Press, Washington, D.C., 1986.

Jensen, G., and H. Birnbaum, "An Analysis of Nursing Home Costs Based on a National Sample," in Birnbaum et al., 1979.

Kane, R. L., and R. A. Kane, "Long-Term Care: Variations on a Quality Assurance Theme," *Inquiry*, Vol. 25, 1988, pp. 132–146.

Kane, R. L., L. A. Jorgensen, B. Teteberg, and J. Kuwahara, "Is Good Nursing-Home Care Feasible," *Journal of the American Medical Association*, Vol. 235, No. 5, February 2, 1976, pp. 516–519.

Kane, R. L., D. M. Olsen, and H. Castle, "Medex and Their Physician Preceptors," *Journal of the American Medical Association*, Vol. 236, No. 22, November 29, 1976, pp. 2509–2512.

Kane, R. L., et al., "Effect of a Geriatric Nurse Practitioner in the Process and Outcomes of Nursing Home Care," *American Journal of Public Health* (forthcoming), 1989.

Kane, R. L., et al., "The Geriatric Nurse Practitioner as a Nursing Home Employee: Conceptual and Methodological Issues in Assessing Quality of Care and Cost Effectiveness," *Academia and Aging: The Teaching Nursing Home Experience*, Springer Publishing Company, New York, 1988.

Kavesh, W. N., R. G. Mark, and B. Kearney, *Medical Care Teams Improve Nursing Home Care and Reduce Costs*, The Urban Medical Group, presented at the 37th Annual Scientific Meeting of the Gerontological Society of America, Austin, Texas, November 1984.

Keeler, E. B., R. L. Kane, and D. H. Solomon, "Short- and Long-Term Residents of Nursing Homes," *Medical Care*, Vol. 19, No. 3, March 1981, pp. 363–370.

Lee, A. J., and H. Birnbaum, Nursing Home Costs in New York State," in Birnbaum et al., 1979.

Lee, A. J., and H. Birnbaum, "The Determinants of Nursing Home Operating Costs in New York State," *Health Services Research*, Vol. 18, No. 3, Fall 1983, pp. 285–308.

Lee, A. J., H. Birnbaum, C. Bishop, and G. Jensen, "A Multiequation Model of Nursing Home Cost Behavior," in Birnbaum et al., 1979.

Lee, A. J., A. Venable, D. Young, and S.P. Fye, *The Urban Health Clinics Demonstration: A Review of the Relevant Literature*, Department of Health and Human Services, Health

Care Financing Administration, Office of Research and Demonstrations, Washington, D.C., May 1983.

Lewis, M. A., B. Leake, V. Clark, and M. Leal-Sotelo, "Case Mix and Outcomes of Nursing Home Patients," *Medical Care*, Vol. 27, No. 48, April 1989, pp. 376–385.

Lichtenstein, R., and J. W. Thomas, "Including a Measure of Health Status in Medicare's Health Maintenance Organization Capitation Formula: Reliability Issues," *Medical Care*, Vol. 25, No. 2, February 1987, pp. 100–110.

Master, R. J., M. Feltin, J. Jainshill et al., "A Continuum of Care for the Inner City: Assessment of Its Benefits for Boston's Elderly and High-Risk Population," *The New England Journal of Medicine*, Vol. 302, No. 26, June 26, 1980, pp. 1434–1440.

McCullagh, P., and J. A. Nelder, *Generalized Linear Models*, Chapman and Hill, New York, 1983.

McKay, N. L., "An Econometric Analysis of Costs and Scale Economies in the Nursing Home Industry," *The Journal of Human Resources*, Vol. 23, No. 1, n.d., pp. 57–75.

Meiners, M., "An Econometric Analysis of the Major Determinants of Nursing Home Costs in the United States," *Social Science and Medicine*, Vol. 16, 1982, pp. 887–898.

Mennemeyer, S., *Long Term Care Costs in New York State*, Discussion Paper No. 455, State University of New York at Buffalo, Department of Economics, 1979.

Mezey, M. D., J. E. Lynaugh, and M. M. Cartier (eds.), *Nursing Homes and Nursing Care: Lessons from the Teaching Nursing Homes*, Springer Publishing Company, New York, 1989.

Minnesota Department of Health, "Facility Manual for Completing Casemix Requests for Classification," Minneapolis, July 1987.

Mitchell, J. B. and H. T. Hewes, "Why Won't Physicians Make Nursing Home Visits?" *The Gerontologist*, Vol. 26, No. 6, 1986.

Morris, J. N., S. Sherwood, M. I. May, and E. Bernstein, "FRED: An Innovative Approach to Nursing Home Level-of-Care Assignments," *Health Services Research*, Vol. 22, No. 1, April 1987, pp. 117–138.

Ray, W. A., C. F. Federspiel, D. K. Baugh, and S. Dodds, "Interstate Variation in Elderly Medicaid Nursing Home Populations," *Medical Care*, Vol. 25, No. 8, August 1987, pp. 738–800.

Record, J. C., M. McCally, S. O. Schweitzer, R. M. Blomquist, and B. D. Berger, "New Health Professions After a Decade and a Half: Delegation, Productivity and Costs in Primary Care," *Journal of Health Politics, Policy and Law*, Vol. 5, 1980, pp. 470–497.

Reinhardt, U. E., "Manpower Substitution and Productivity in Medical Practice: Review of Research," *Health Services Research*, 1973, pp. 220–227.

Roddy, P. C., L. Korbin, and M.R. Meiners, "Resource Requirements of Nursing Home Patients Based on Time and Motion Studies," *NCHSR Health Care for the Aging: Long Term Care Studies Program Research Report*, DHHS Publication Number (PHS) 87-3498, April 1987.

Rosko, M. D., R. W. Broyles, and W. E. Aaronson, "Prospective Payment Based on Case Mix: Will It Work in Nursing Homes?" *Journal of Health Politics, Policy and Law*, Vol. 12, No. 4, Winter 1987, pp. 683–701.

Ryan, J. F., R. B. Fetter, and H. L. Smits, "Case Mix of Public Patients in Skilled Nursing Facilities in Connecticut," *Medical Care*, Vol. 25, No. 1, January 1987, pp. 46–51.

Scanlon, W., and W. Weissert, "Nursing Home Case Function Analysis: A Critique," *Health Services Research*, Vol. 18, No. 3, Fall 1983, pp. 387–391.

Schlenker, R. E., "Case Mix Reimbursement for Nursing Homes," *Journal of Health Politics, Policy and Law*, Vol. 11, No. 3, Fall 1986, pp. 445–461.

Schlenker, R. E., and P. W. Shaughnessy, "Case Mix, Quality, and Cost Relationships in Colorado Nursing Homes," *Health Care Financing Review*, Vol. 6, No. 2, Winter 1984, pp. 61–71.

Schlenker, R. E., P. W. Shaughnessy, and I. Yslas, "Estimating Patient Level Nursing Home Costs," *Health Services Research*, Vol. 20, No. 1, 1985, pp. 103–128.

Schneider, D., et al., *New York State Long Term Care Case Mix Reimbursement Project: Executive Summary. Derivation of RUG-II*, Albany, New York, December 1984.

Schultz, P. R., and F. B. McGlone, "Primary Health Care Provided to the Elderly by a Nurse Practitioner/Physician Team: Analysis of Cost Effectiveness," *Journal of the American Geriatrics Society*, Vol. 25, No. 10, 1977, pp. 443–446.

Shaughnessy, P. W., R. E. Schlenker, and M. B. Polesovsky, "Medical and Non-Medical Case Mix Differences in Colorado Nursing Homes," *Medical Care*, Vol. 24, No. 6, June 1986, pp. 482–495.

Smith, D. W., A. J. Hogan, and J. E. Rohrer, "Activities of Daily Living as Quantitative Indicators of Nursing Effort," *Medical Care*, Vol. 25, No. 2, February 1987, pp. 120–130.

Sox, H. C., "Quality of Patient Care by Nurse Practitioners and Physician's Assistants: A Ten-Year Perspective," *Annals of Internal Medicine*, Vol. 91, No. 3, September 1979, pp. 459–468.

Swan, J. H., C. Harrington, and L.A. Grant, "State Medical Reimbursement for Nursing Homes, 1978–86," *Health Care Financing Review*, Vol. 9. No. 3, Spring 1988, pp. 33–50.

Swart, J. C., "The Role of the Nurse Practitioner," *Journal of Long Term Care Administration*, Vol. 11, No. 3, Fall 1983, pp. 19–22.

Walsh, T., "Patient-Related Reimbursement for Long-Term Care," in V. LaPorte, and J. Rubin, *Reform and Regulation in Long Term Care*, Praeger, New York, 1979.

Wiener, J., K. Liu, and G. Schieber, "Case-Mix Differences Between Hospital-Based and Freestanding Skilled Nursing Facilities," *Medical Care*, Vol. 24, No. 12, December 1986, pp. 1173–1182.

Willemain, T. R., and R. B. Mark, "The Distribution of Intervals Between Visits as a Basis for Assessing and Regulating Physician Services in Nursing Homes," *Medical Care*, Vol. 18, No. 4, April 1980, pp. 427–441.