

Effects of a Geriatric Nurse Practitioner on Process and Outcome of Nursing Home Care

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Abstract: We compared measures of quality of care and health services utilization in 30 nursing homes employing geriatric nurse practitioners with those in 30 matched control homes. Information for this analysis came from reviews of samples of patient records drawn at comparable periods before and after the geriatric NPs were employed. The measures of geriatric nurse practitioner impact were based on comparisons of changes from pre-NP to post-NP periods. Separate analyses were done for newly admitted and long-stay residents; a subgroup of homes judged to be best case examples was

analyzed separately as well as the whole sample. Favorable changes were seen in two out of eight activity of daily living (ADL) measures; five of 18 nursing therapies; two of six drug therapies; six of eight tracers. There was some reduction in hospital admissions and total days in geriatric NP homes. Overall measures of medical attention showed a mixed pattern with some evidence of geriatric NP care substituted for physician care. These findings suggest that the geriatric NP has a useful role in nursing home care. (*Am J Public Health* 1989; 79:1271-1277.)

Introduction

Nursing home care has been the subject of widespread concern and criticism. Within professional circles, it enjoys little prestige. It is viewed as low technology care with little hope of patient improvement and little opportunity to use professional skills.¹ Physician visits tend to be infrequent, conforming to the minimal levels required to authorize the care of residents.²

Ironically, when care is provided to nursing home residents they show great responsiveness. In fact, almost any intervention produces a positive response.³ One promising approach to improve the care of the elderly in nursing homes engages nurses to work as geriatric nurse practitioners (GNPs) to provide or coordinate primary care for residents. An early study in Salt Lake City showed that the geriatric NPs could work effectively as part of a multi-disciplinary team to improve the function of nursing home residents and reduce the costs of hospital care.⁴ A study in Boston showed similar improved care and savings were possible.⁵

The enthusiasm of these results has not been matched by patterns of funding. Direct payment for the services of geriatric NPs was not allowed under Medicare Part B if the services were given without on-site physician supervision. Thus geriatric nurse practitioner care in nursing homes was discouraged.

With the support of the W.K. Kellogg Foundation, beginning in 1976, the Mountain States Health Corporation [MSHC] arranged for nurses working in nursing homes throughout four northwestern states to be trained through the continuing education (CE) programs at three nursing schools. The training used the already established CE model of four months of didactic training at the university and eight months of preceptorship with a local physician at the home site. The

nursing homes agreed to add the geriatric NPs to their staffs and to allow them to function in the expanded role for which they had been trained. A contract for a minimum of 18 months of employment after training was negotiated, with the geriatric nurse practitioner being an employee of the nursing home rather than an independent contractor or an employee of a physician group. In 1982, the program expanded to cover 13 western states, using four western schools of nursing to provide the continuing education.

After the program was well established, an evaluation of the effect of adding these GNPs on nursing home costs and quality of care was undertaken. The study design had three major components: a prospective study of the functional changes seen in a sample of residents treated by geriatric NPs compared with matched controls, a retrospective review of the records from the geriatric nurse practitioner homes and matched controls, and an analysis of the costs to both payors and nursing homes associated with this innovative approach to care.⁶ This paper describes the results of the retrospective study.

Methods

Because the study was mounted after the program was well established, there was no opportunity to design a randomized clinical trial. From the pool of about 100 nursing homes then employing trained geriatric nurse practitioners, 30 pairs were developed by matching each GNP nursing home to a control home in the same state* on the basis of proportion of Medicare cases, ownership, corporate management, number of beds, and rural/urban location. Each potential match required both a GNP home and a control home willing to allow access to records (and for some, patients).

A quasi-experimental design was used, consisting of pre- and post-geriatric nurse practitioner periods for both groups of homes. The data source was the resident's nursing home records. The pre-GNP period consisted of one year prior to the geriatric NPs' employment in that role, and the post-GNP period began *with* the NP's employment and lasted up to two years for any resident (or until the resident was permanently discharged from the home). The training period was not part

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*Washington, Oregon, California, Idaho, Colorado, Arizona, Montana, New Mexico.

of the study. The time periods for the control home coincided with those for the paired geriatric nurse practitioner home. Once these general time periods were established for each sample pair, some minor adjustments were made (never more than a six-month shift) to accommodate the dates of the study to the home's fiscal year in order to link financial and practice data. This time-based sampling allowed a cross-section of periods among the 30 pairs that encompassed more than eight years of practice and changes in the external environment.

Within each nursing home, two samples of residents' records were selected randomly—one for the pre-period and a second for the post-period. The same number of records was sought in each home, resulting in varying sampling ratios depending on numbers of beds and turnover rates. The majority of the homes (or the wings that used a geriatric nurse practitioner) were approximately 100 beds. Within each sample, a 2:1 ratio of newly admitted to longer stay residents was planned; however, it was not possible to achieve this ratio in some cases because of insufficient numbers of newly admitted cases. As shown in Table 1, the final pre-GNP sample was more equally weighted. Because the post-GNP period was two years, a slight variation in the sampling method was used. The sample was divided into the two years but the second year sample added only new admissions.

Demographic information, functional status, nursing therapies, medications, medical attention, and use of hospital and emergency room services were abstracted from the medical records. The general time frame used for this component was to assess the resident's condition on entrance to the nursing home (or the beginning of the study period for long stays) and at discharge (or end of study period). For selected variables, a third status point was used at three months, the median stay for most admissions. For many variables where use varied with time, a two-week window was defined and the rates calculated for that period.

In addition to tabulating numbers of medications given (separated by regular and PRN (as occasion requires) use), specific dose-equivalents of six types of drugs most commonly used in nursing homes were calculated: psychotropics, sedatives, tricyclic antidepressants, diuretics (except furosemide), furosemide, and digoxin.

Orders for various services (medications, laboratory tests, nursing orders, and special services) were tabulated according to the person ordering them and the mode of

ordering them (i.e., in person or by telephone). Visits by attending physicians and specialized personnel (podiatrists, dentists, physical therapists, occupational therapists) were tabulated. The frequency of services was calculated as a rate per day of stay in the nursing home. Use of emergency room services was separated by whether the visit was prompted by an emergency or for routine testing. Hospital admissions and lengths of stay were recorded. The data on hospital use are again presented as a rate per day, using the patient's total length of stay in the nursing home as the denominator.

A series of tracers was developed for conditions for which record data might be available (diabetes, congestive heart failure, hypertension, new urinary incontinence, chronic urinary incontinence, feeding difficulty, acute confusion, and fever) to indicate whether appropriate steps in care were taken when potentially indicated. Each tracer was reviewed by a panel of clinicians. Because some judgment is involved in whether these steps are always indicated, different values were assigned to the individual steps by a second panel of physicians, who were independent of the project. The summary tracer scores were then used to compare quality changes across time.

Medical record abstraction was performed by trained registered nurses who were not involved in the original study. A week-long session was held to train and test their abstracting skills. In addition, a field manual was developed. The data collection was supervised by staff of the Mountain States Health Corporation.

Analysis

Analyses focused on whether the pattern of pre-post change in nursing homes employing geriatric NPs differed from that in control homes. In some instances the variable of interest was calculated in terms of the change from admission to discharge (or to the three-month time point). The availability of pre-GNP data minimized the effects of any baseline differences between GNP and control homes. The basic analytic tests used analysis of variance for continuous data and chi-square tests for categorical data. The tests for changes in specific medication use employed repeated measures MANOVA. Specific attention was paid to the problem of outliers and their possible effects on mean values.

Newly admitted residents and long-stay residents were analyzed separately. In order to be sure that the analysis addressed the best examples of geriatric nurse practitioner

TABLE 1—Comparisons of Demographic and Clinical Parameters among Study Subjects and Controls

	New Admissions				Long-Stay Patients			
	Pre		Post		Pre		Post	
	GNP	Cont	GNP	Cont	GNP	Cont	GNP	Cont
(N=)	(894)	(981)	(2189)	(2262)	(703)	(606)	(1068)	(1035)
Mean age (yrs)	81.7	82.2	81.7	82.1	83.4	83.7	84.8	84.6
% Admitted from								
Home	22.4	21.1	21.1	21.5	25.6	19.5	2.1	18.4
Hospital	58.2	61.5	59.3	61.8	50.4	60.5	55.4	60.2
Other	19.4	17.4	19.6	16.7	24.0	20.0	22.5	21.4
% with Diagnosis on Admission								
Dementia	27.5	23.2	22.6	23.2	25.1	24.4	30.4	31.3
Cerebrovascular disease	28.6	25.3	27.0	26.8	31.9	27.8	29.3	26.7
Disease of nervous system	15.3	16.9	20.2	16.2	16.3	15.8	18.5	18.6
Hip fracture	14.0	14.8	15.0	14.4	13.9	15.0	14.7	15.2
Cancer	9.8	10.8	10.5	11.6	6.1	6.6	6.9	7.2
Hypertension	18.4	15.9	21.5	21.1	15.7	17.4	16.7	17.1
Ischemic heart disease	22.4	23.7	22.4	23.2	22.4	24.9	20.6	25.7

effectiveness, the sample was further divided by the extent of GNP role implementation as reflected in interviews conducted with the geriatric nurse practitioners after the evaluation was completed. The GNPs were asked about their role and each practice was classified as full or partially implemented on the basis of the amount of time they reported working on geriatric nurse practitioner tasks. Those working 50 percent or more were considered fully implemented.⁷ The results for the fully implemented pairs were calculated in addition to those of the overall sample.

Results

Descriptive Data

As shown in Table 1, data are available on 3,184 cases in the pre-GNP period and on 6,554 cases in the post-GNP period. The pre-GNP ratio of new admissions to long-stay residents is 1.27 for geriatric nurse practitioner cases and 1.63 for control cases. For the post-GNP period the corresponding ratios are 2.0 and 2.2.

Table 1 also compares some basic demographic and historical parameters for the various subgroups. The prevalence of the major chronic disease diagnoses was generally comparable, but among new admissions the GNP residents were more likely to have a diagnosis of dementia in the pre-GNP period and nervous system disease in the post-period. In the post-GNP period, geriatric nurse practitioner residents were more likely to have been admitted from home and less likely to come from the hospital. This same pattern held for long-stayers in both the pre- and post-GNP periods. Not surprisingly, long-stay residents were slightly older than new admissions.

Functional Status

Change in functional status from admission to discharge was calculated as both a continuous score based on the number of domains in which the patient was dependent and a fixed score of change from dependence to independence within each domain. These two approaches allowed for different statistical manipulations but the patterns of overall findings were the same. Table 2 shows that there were few significant differences noted in the extent of change between the geriatric nurse practitioner and control subjects. This table summarizes the differences found among the many analyses performed. Here and in the rest of the tables, the figures presented are the net difference for that variable between GNP and non-GNP from pre to post. The signs indicate the direction of the difference: a positive sign indicates a relative increase in the GNP score compared to the non-GNP from pre to post; a negative sign indicates the reverse.

Case-Mix

Case-mix at the time of admission to the nursing home was measured on the new admissions in three ways: 1) the level of dependence for each of the functional measures shown in Table 2; 2) the frequency of ordered nursing therapies; 3) a case-mix index adapted from that used in Minnesota as a basis for nursing home payment.⁸

Comparisons of individual functional status items on admission showed generally no difference, but in two areas the changes suggested that geriatric nurse practitioner patients were less impaired over time. For the complete sample, more GNP patients were ambulatory and mentally alert. The latter finding was also true for the full implementation subset.

TABLE 2—Change in Functional Status between Admission and Discharge

Functional Status	New Admissions		Long-Stay Patients	
	Complete Sample	Full Implementation	Complete Sample	Full Implementation
Ambulation	-.01	+.01	+.10	+.14
Transferring	+.09*	+.14**	+.08	+.05
Feeding	-.02	-.03	-.02	-.04
Toileting—Urine	+.02	+.02	+.03	+.11
Toileting—Feces	+.01	-.03	+.03	.00
Dressing	+.09**	+.15**	+.04	-.01
Total Number of Dependencies (0-6)	-.07	-.19	-.14	-.14
Mental Alertness	-.02	-.07***	+.05	-.01
Non-Disruptive Behavior	-.03	.00	+.01	+.04

Number = [(Discharge_{PostGNP} - Admission_{PostGNP}) - (Discharge_{PreGNP} - Admission_{PreGNP})] - [(Discharge_{Post Non-GNP} - Admission_{Post Non-GNP}) - (Discharge_{Pre Non-GNP} - Admission_{Pre Non-GNP})]
 + = GNP group relative increase
 - = GNP group relative decrease
 The possible scores at each point in time ranged from 1 to 5 for ambulation, -6 to +6 for change in total number of dependencies, and 1 and 4 for all other variables.
 *.05 < P ≤ .10 **.01 < P ≤ .05 ***P ≤ .01.

These patterns were somewhat different when nursing therapies were used as the basis for case mix. Table 3 shows changes from pre to post for the GNP and control groups. Here the signs indicate an increase or decrease in the ratio. The results reveal a pattern of increased use of several activities that call for patient training (e.g., bowel and gait) and restorative nursing in GNP homes. Moreover, the reductions in use of restraints and even soft diets may reflect an effort by the geriatric nurse practitioners to avoid such approaches to enforced dependency.

Figure 1 compares the patterns of the constructed case-mix index, in which possible scores ranged from 1 to 10. Although both the GNP and non-GNP groups showed pre-

TABLE 3—Change in the Percent of Residents Receiving Nursing Therapies at Admission for New Admits by Level of GNP Implementation

Therapies	Complete Sample	Full Implementation
Decubitus Care	+1.8	+3.9
Foley Catheter	-2.1	-0.1
Bladder Training	+0.2	+3.1
Bowel Training	+3.1*	+1.5
Dressing Change	-1.8	-3.3
Gait Training	+10.8***	+15.1***
I.V. Fluid	+0.3	+0.1
Tube-Feeding	-0.1	-0.6
Ostomy Care	-0.5	+1.5
Restorative Nursing	+15.2***	+23.9***
Oral Suction	+0.3	+0.6
Fracture Care	+2.1	+4.7**
Tracheostomy	+0.1	+0.3
Oxygen	-2.6*	-2.8
Prosthesis Care	+1.2*	+0.8
Range of Motion	+0.9	-1.2
Pureed Diet	+0.5	-5.1**
Soft Restraints	-5.3*	-8.8**

Number = [Post_{GNP} - Pre_{GNP}] - [Post_{Non-GNP} - Pre_{Non-GNP}]
 + = GNP relative increase from pre to post;
 - = GNP relative decrease from pre to post
 The possible values for each point in time range from 0-100%, based on a yes-no subject level variable.
 *.05 < P ≤ .10 **.01 < P ≤ .05 *** P ≤ .01

post differences, there was little difference in change over time between the groups. The median value for the GNP group was 5.85 in the pre-period and 6.35 in the post-period compared to 5.51 and 5.96, respectively, for the controls. The size of the differences in both means and medians was examined using both ANOVA and various nonparametric tests with the consistent finding of no difference between the GNP and control groups.

Medical Attention

Medical attention was measured in terms of frequency of visits and level of activity. The patterns of change over time are shown in Table 4, where a positive sign reflects a relative increase among GNP groups compared to controls. Among new admissions, there is a substantial reduction in both medication and laboratory orders. The reduction in nursing orders by physicians is reduced when the additive effect of the GNP is considered. By comparing the rates for physicians and the total rates for each service, one can discern a modest pattern of substitution for several services. Interestingly, the rate of physician visits declines for new admissions and increases slightly for the full implementation long-stay residents. There is a consistent pattern of increased physical therapy visits, podiatry, dental care, and occupational therapy, but only the former is significant for the long-stay patients.

Medications

Medication use was examined several ways. The overall number of drugs and doses given was tabulated from the

medication sheets; rates were calculated separately for regular administration and PRN use. In addition, dose equivalents were calculated for six common drug classes. These were further analyzed by examining their rate of use with patients who might be expected to require them. The results shown represent changes in the pre-post patterns for differences in use rates from admission to discharge. It is important to appreciate that these summary results can be achieved by either a decrease in post-GNP use or less of an increase.

The summary in Table 5 uses a positive sign to reflect a relative increase for the GNP groups compared to the controls. The numbers shown are differences between GNP and control groups for two-week dosage rates used to summarize the pre-post change in differences from admission to discharge.

The most striking observation is the relative lack of effect. Once again, the differences occur among the long-stay residents of nursing homes rather than newly admitted cases. This overall absence of significant differences resulted from several different phenomena. In some cases, there was truly little shift in usage rates. In others, similar patterns of differences were present for both GNP and controls.

For example, there is much concern about the potential excess use of psychotropic medications among nursing home residents. The net GNP use of psychotropic medication was greater than the controls' for both those with and without disruptive behavior. The GNP mean dose equivalents for psychotropics did not decrease from admission to discharge

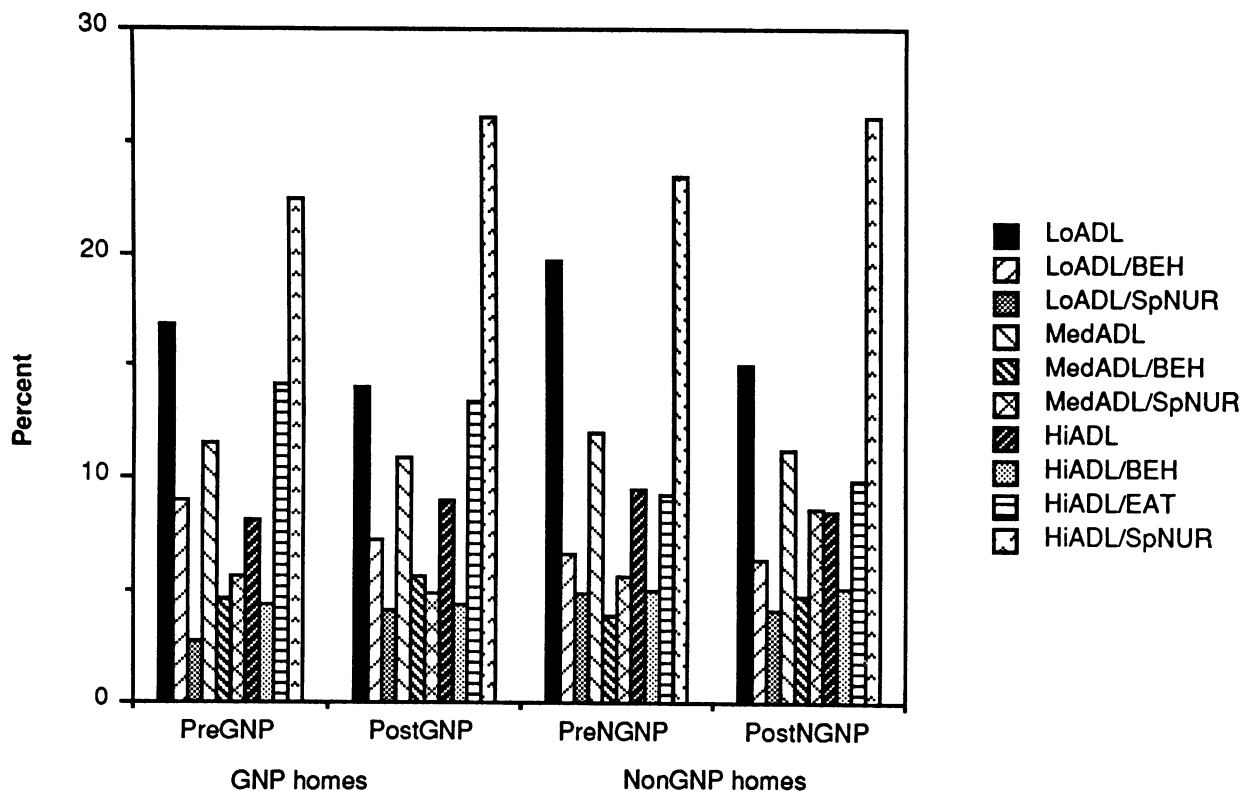


FIGURE 1—Effects of a Geriatric Nurse Practitioner on the Process and Outcomes of Nursing Home Care

ADL = Activities of Daily Living
 BEH = Behavior
 SpNUR = Special Nursing
 EAT = Eating
 Lo = Low
 Med = Medium
 Hi = High
 GNP = Geriatric nurse practitioner
 NGNP = Control

TABLE 4—Changes in Measures of Medical Attention per 1,000 Patient Days

	New Admissions		Long-Stay Patients		Ranges
	Complete Sample	Full Implementation	Complete Sample	Full Implementation	
Medication Orders					
by Physician	-6.35***	-8.58***	-1.68	-1.57	0-517
by Telephone	-6.52***	-7.39**	-3.56	-.05	0-1049
Total (with GNP)	-9.33***	-10.74**	-3.46	+.52	0-1066
Nursing Orders					
by Physician	-3.61***	-4.45**	-1.16	-1.85	0-289
by Telephone	-1.68	-1.79	-3.99**	-2.94	0-629
Total (with GNP)	-2.44	-2.53	-3.66	-2.95	0-629
Lab Tests and X-Ray					
by Physician	-2.51***	-3.28***	-1.09	-.81	0-414
by Telephone	-2.40***	-2.38	-.72	+1.11	0-333
Total (with GNP)	-3.62***	-3.83*	-.59	+1.11	0-690
Special Orders					
by Physician	+.29	+.94*	-.59	-1.11	0-151
by Telephone	+.07	+1.33**	-.19	-.22	0-200
Physician Visits					
with Examination	-2.21	-3.26	+.60	+1.80	0-1586
without Examination	-.92	-1.04	-1.45	+.72	0-482
Total	-3.22*	-4.44*	-.82	+2.46	0-2069
Podiatry Visits	+.26	+1.25*	+.32	+.09	0-375
Dental Visits	+1.05	+.87	+.03	+.46	0-983
Physical Therapy Sessions	+7.29	+14.38	+14.57**	+17.81**	0-2375
Occupational Therapy Sessions	+.43	+7.42	+2.20	+7.44	0-2475

Number = [Post_{GNP} - Pre_{GNP}] - [Post_{NON-GNP} - Pre_{NON-GNP}] Per 1,000 patient days
 + = GNP relative increase from pre to post
 - = GNP relative decrease from pre to post
 Ranges for any given point in time across all groups are given in the column titled "Ranges".
 *.05 < P ≤ .10 **.01 < P ≤ .05 ***P ≤ .01

for the complete sample, and also ended at a slightly higher level in the post-period than in the pre-period. The control levels did not change from admission to discharge in the post-period and remained at a level below that of the GNP. The GNP overall level of mean dose equivalents for psychotropics in the full implementation sample was lower for the post-period than the pre-period, and decreased within the post-period from admission to discharge. The control level was higher for the post-period than the pre-period.

Tracers

Table 6 shows that in a number of instances the use of GNPs was associated with significant improvements in quality scores. This finding pertains to the newly admitted patients even more than to the long-stay residents. As expected, improvements in quality are somewhat more common among the fully implemented subgroup. In the newly admitted group, positive GNP findings in quality of care are observed in the diabetes and feeding tracers for both, and in the new urinary incontinence tracer in the full implementation sample. Among the long-stay patients, positive effects are found in the congestive heart failure and acute confusion tracers in the full implementation sample and fever in the total sample.

Utilization

There was no difference in the rate of use of emergency rooms for either true emergencies or routine testing. However, the GNP patients were less likely to be admitted to hospital (Table 7). The fully implemented subgroup of new admissions had a significant relative reduction in emergency, elective, and total admissions, based on ANOVA analyses. Total admissions were also significantly reduced for the complete sample

of new admissions. The significant relative reduction in emergency and total hospital days occurred among both the full implementation and complete samples of new admissions.

Figure 2 shows the pattern of destinations among those discharged from the nursing homes. Among new admissions, an increased proportion of GNP patients discharged from the nursing home went home. The fully implemented subset of new admissions and long-stay patients were also less likely to be discharged to a hospital.

The discharge patterns were further tested using a series of conditional logistic regression models to control for the effects of other potentially confounding variables including age, source of admission, major diagnoses, payment source, ADL dependencies, and mental status. Separate analyses were performed to examine in sequence the probability of: 1) being discharged dead vs discharged alive or remaining in the nursing home; 2) those alive, going to the hospital or not; 3) those alive, going to the community or not; and 4) those alive and not going to the hospital, going to the community or not. There were no significant differences between GNP and controls during the pre-GNP period. For the post-GNP period the newly admitted GNP residents were less likely to be hospitalized (odds ratio 0.76; confidence interval = 0.59, 0.96) and more likely to be discharged to the community (OR 1.22; CI = 1.02, 1.5). Among the long-stay patients, GNP residents were less likely to be discharged to the hospital. (OR 0.50; CI = 0.34, 0.72).*

Discussion

These data suggest that the geriatric nurse practitioners improved the quality of nursing home care in several impor-

*Data available on request to authors.

TABLE 5—Changes in Medication Use among Nursing Home Patients

	New Admissions		Long-Stay Residents		Ranges
	Complete Sample	Full Implementation	Complete Sample	Full Implementation	
Psychotropic					
All Subjects	+ .26	-.19	+3.20***	+3.30*	0-71.4
Disruptive Behavior	+ .54	N.A.	+2.53*	N.A.	0-71.4
No Disruptive Behavior	-.21	N.A.	+5.09**	N.A.	0-71.4
Sedatives					
All Subjects	-.14	-.44	+ .15	-.29	0-10.0
Disruptive Behavior	-.54	N.A.	+ .23	N.A.	0-10.0
Tricyclic					
All Subjects	+ .19	-.36	+1.14	+4.59*	0-30.0
Disruptive Behavior	+1.53	N.A.	-.01	N.A.	0-20.0
Depressed	+1.11	N.A.	N.A.	N.A.	1.0-20.0
Diuretics					
All Subjects	+ .01	-.32	+ .08	+ .01	0-8.0
Congestive Heart Failure + Hypertension	-.03	N.A.	+1.53	N.A.	0.1-8.0
Lasix					
All Subjects	+ .04	+ .19	-.11	-.59**	0-7.1
Congestive Heart Failure + Hypertension	+ .65	N.A.	-.54	N.A.	0.1-7.1
Digoxin					
All Subjects	-.04	+ .02	+ .11	+ .06	0-3.0
Congestive Heart Failure	-.08	N.A.	+ .21	N.A.	0-3.0
Total Doses	-.04	-.26	-.86**	-1.17***	0-43.7
Number of Regular Drugs	+ .01	-.01	-.01	-.02	0-1.7
Number of PRN Drugs	-.01	+ .00	-.02*	+ .03*	0-1.5

Number = [(Discharge_{PostGNP} - Admissions_{PostGNP}) - (Discharge_{PreGNP} - Admission_{PreGNP})] - [(Discharge_{Post Non-GNP} - Admissions_{Post Non-GNP}) - (Discharge_{Pre Non-GNP} - Admission_{Pre Non-GNP})]
 + = GNP group relative increase
 - = GNP group relative decrease
 Daily dose equivalent ranges for any given point in time across all groups are given in the column titled "Ranges".
 *.05 < P ≤ .10 **.01 < P ≤ .05 *** P ≤ .01

TABLE 6—Comparisons of Performance on Tracer Conditions

	New Admissions		Long-Stay Residents		Ranges
	Complete Sample	Full Implementation	Complete Sample	Full Implementation	
Diabetes	+3.00***	+3.59**	+1.25	+3.46	-13.7-
Congestive Heart Failure	-.22	+ .36	+1.04	+3.63**	-18.4-
Hypertension	-.27	-.16	+ .19	-.09	-10.0-
New Urinary Incontinence	+ .86	+1.25**	-.10	-.40	0-6.7
Chronic Urinary Incontinence	+ .49	+ .91	+ .31	+ .94	-7.0-
Feeding	+1.00**	+1.89***	+ .56	+1.01	0-11.0
Confusion (Acute)	+1.12	-.04	+1.96	+5.11***	0-21.0
Fever (Average)	-.34	-1.20*	+ .70	+ .89	-2.0-

Number = [Post_{GNP} - Pre_{GNP}] - [Post_{Non-GNP} - Pre_{Non-GNP}]
 + = GNP relative increase from pre to post;
 - = GNP relative decrease from pre to post
 Tracers score ranges for any given point in time across all groups are given in the column titled "Ranges".
 *.05 < P ≤ .10 **.01 < P ≤ .05 *** P ≤ .01

tant areas. The benefits are most evident in the tracer studies, which look at the management of specific conditions. The GNP patients show strong indications of closer attention. When these results are compared with the geriatric nurse practitioners' perceptions of where they were having the greatest impact, the patterns validate the GNP's observations in some areas. For example, the GNPs felt that they had made a substantial impact in drug and laboratory use,⁷ and both areas showed reductions among the new admissions. The data suggest a modest substitution of GNP activity for physician activity. The broader measures, such as changes in functional status, similarly do not show much impact although the GNPs thought they were having an effect there.

The geriatric NPs also thought they were permitting an increasing acute case mix. In fact, case mix acuity increased in

both the GNP and control homes, but the change is attributable to external forces rather than to adding a geriatric nurse practitioner. Because the timetable for each home was constant within each pair of homes but different across pairs, the effects of changes brought about by shifts in hospital reimbursement and changes in funding rules for nursing home care were minimized in this analysis. The changes in nursing therapies suggest more nursing attention from the GNPs and possibly less use of undesirable approaches to care, such as restraints.

The geriatric nurse practitioner's potential to save total costs of care is suggested by the data on hospital utilization, especially the reduction in hospital days. The savings occur through fewer hospitalizations and less emergency room use. At the same time, GNP patients are more likely to be discharged home from the nursing home.

TABLE 7—Hospital Utilization per 1,000 Patient Days

	New Admissions		Long-Stay Residents		Ranges
	Complete Sample	Full Implementation	Complete Sample	Full Implementation	
Emergency Room Visits					
For Tests	-1.12	-1.81	-.27	-.02	0-453
Not Just for Tests	+.21	-.12	+.14	+.21	0-656
Total	-.09	-1.94	-.14	+.19	0-656
Number of Hospital Admission					
Elective	-.26*	-.54**	+.10	+.08	0-143
Emergency	-.43*	-.96***	-.20	-.16	0-91
Total	-.69**	-1.50***	-.10	-.08	0-143
Hospital Days					
Elective	-.81	-3.21**	+.53	+.33	0-838
Emergency	-5.97**	-8.02**	-1.92	-2.15	0-750
Total	-6.77***	-11.23***	-1.39	-1.82	0-838

Number = [Post_{GNP} - Pre_{GNP}] - [Post_{Non-GNP} - Pre_{Non-GNP}]
 + = GNP relative increase from pre to post;
 - = GNP relative decrease from pre to post
 The range for each point in time across all groups are given in the column titled "Ranges".
 * .05 < P ≤ .10 ** .01 < P ≤ .05 *** P ≤ .01

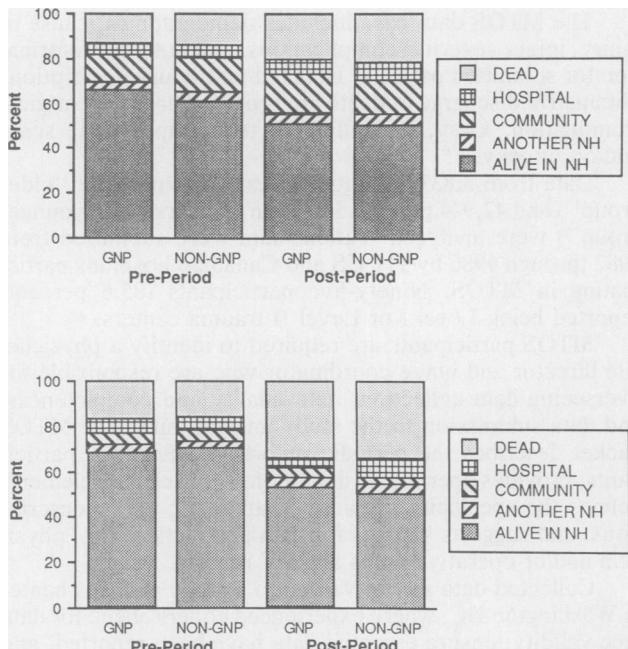


FIGURE 2—Pattern of Discharge Destination by Study Period and Geriatric Nurse Practitioner Status for New Admissions (top figure) and Long-Stay Patients (bottom figure).

The design of the study presents some unavoidable limitations germane to the interpretation of the findings. Although the analysis did control for baseline differences, it cannot control for unmeasured differences between the nursing homes. The homes that undertook this program were adopters and may reflect a more aggressive style of care. The matching did not extend to the level of comparing specific information about staffing ratios.

There were also differences among the GNPs attributable to their individual interests, training, level of physician support, and the administration orientation of their nursing homes. Some of these differences were captured in the interviews with the GNPs, the directors of nursing, and the

administrators of the participating homes.⁷ To assess the effect of the varied level of implementation of the GNP role, we examined separately those homes where the GNP was primarily performing her intended role and found no consistently different pattern of findings from the total sample.

Taken together, the results of this study suggest that the GNP has a useful and cost-effective role to play in nursing home care. The model tested here relies on the geriatric nurse practitioner as a nursing home employee. It is very possible that GNPs may have an even greater impact if they can operate outside the administrative pressures imposed by this form of sponsorship.

ACKNOWLEDGMENTS

Funding for this project was provided by grants from the Robert Wood Johnson Foundation to the University of Minnesota School of Public Health, from the Health Care Financing Administration to RAND Corporation, and from the W.K. Kellogg Foundation to Mountain States Health Corporation.

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