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Relating Personnel Costs in Special Care Units and in Traditional Care Units to Resident Characteristics

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Abstract

Background: There are over 16 000 nursing homes in the United States (US), among which approximately 70% of residents are cognitively impaired. Reflecting this, approximately 20% of US nursing homes maintain Special Dementia Care Units (SCUs). SCUs supposedly provide more staff time and more specialized staff assignments to residents than do traditional care units.

Aims of the Study: This paper addresses the issues of staff time and assignment: do the costs of personal care inputs differ according to whether they are provided by SCUs or in traditional care settings? Related to this, are differences associated with the different settings, or are they accounted for by resident characteristics within the settings?

Methods: Given the bias generally associated with collection of staff time data, the author developed (supported by the Health Care Financing Administration and the National Institute on Aging) and used in this study a barcode-based system ('InfoAide'). Using InfoAide, each provider automatically recorded task- and resident-specific time expenditure data which were subsequently monetized, using prevailing local wage rates. Individual resident personal characteristics and status data were provided by another simultaneous study of SCU impacts among the same residents. Regression analysis (MANCOVA for significantly correlated dependent variables) was used to examine the relationships between cost and SCU/traditional status, and individual resident characteristics, separately for each category of provider.

Results: Controlling for resident characteristics, the cost of aide care is significantly (positively) related ($p \leq 0.01$) to SCU status. Cognitive impairment, ADL impairment and being restrained are also related to higher aide care cost ($p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.05$, respectively). The same is generally true of Speech Therapy, Social Service and care by licensed practical nurses, although the differences between SCU and traditional care units are essentially trivial—and there are no SCU/traditional care differences for registered nurses.

Discussion: SCU/traditional unit status, even when combined with the central resident covariates, explains very little variance in service costs, other than among nursing aides; in separate MR analyses in which monetized service time was the dependent variable, the cumulative adjusted R^2 among aides was 0.37; for each of the other categories of service provider, the adjusted R^2 was less than 0.10. There were differences (particularly in cognitive and ADL impairment) between SCU and non-SCU residents; these differences were related to differences in basic services which were, in turn, provided primarily by aides. The increased level of care provided in SCUs is attributable primarily to nursing aides. However, there is relatively little (albeit statistically significant) variation in more 'elective' services according to individual characteristics or to SCU versus traditional unit placement.

This discussion is limited by the absence of analyses of possible interactions among variables, and by the cross-sectional nature of the data presented here.

Implications for Health Care Provision and Use: This absence of a substantial relationship between SCU/traditional status suggests that dichotomization between SCU and traditional care is misplaced, and that more attention should perhaps be given to the targeting and tailoring of services related to individual gradations of impairment and need.

Implications for Health Policy Formulations: A very considerable literature has developed recently pertaining to Special versus Traditional care for persons with dementing illness. These data suggest that this is not a fruitful distinction, and that more effort should be devoted to defining and quantifying the elements and ***quality*** **of care provided to nursing home residents.**

Implications for Further Research: Further research is needed into the components of optimal quality care for demented nursing home residents, and into the interaction among these components as they relate to resident outcomes.

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Introduction and Background

There are over 16 000 nursing homes in the United States (US), in which approximately 70% of residents are cognitively impaired.[1] Reflecting the needs of this population, approximately 20% of US nursing homes maintain Special Care Units (SCUs), which are specifically targeted to the needs of persons with dementing illness.[2] In addition to serving as a separate residential and/or activity locus for these residents, SCUs supposedly provide more staff time, and more specialized staff assignments. This paper addresses a fundamental issue relating to the nature, quality and quantity of resident care inputs: do the costs of personal

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care inputs differ according to whether they are provided in a special care or a traditional care setting? Related to this, are any differences associated with the different settings, or are they accounted for by resident characteristics?

Differentiation is made here between *costs* (also defined as imputed expenditures), in this case monetized service-time inputs, and *charges* made by nursing homes for services to residents. While the latter usually are regarded as estimates of the former, it is more than possible, even probable, that charges are sensitive to market pressures and, therefore, that they do not accurately reflect actual costs associated with care for different individuals, in different settings.

The data for these analyses were collected from a random sample of SCUs and traditional units (non-SCUs) in nursing homes. However, the approach and the analyses could as well pertain to care given in connection with forms of psychiatric disorder other than dementia.

In 1986 Hu *et al*.[3] suggested that 'The usual approach followed to estimate the cost of nursing home care is based on the assumption that all subjects are homogeneous and there is no case mix problem' (p. 161). The innovative study of Hu *et al*. was extremely important as pilot research; however, it included only 25 nursing home residents from three facilities, and cost data were based on estimates of labor costs obtained through diaries maintained by nursing staff over a two-week period. Given the wide range of impairments which are found among demented residents, the study sample was too small to permit (statistical) detection of differences among subgroups. Despite these difficulties, the authors reported that personnel costs in nursing homes were $2384 more for demented residents than for non-demented residents.

Several of the National Institute on Aging (NIA) cooperative studies on special dementia care[4] have specifically addressed definitional issues, i.e., differences between (SCUs) and non-SCUs, and different *types* of special care unit. Of these, the study presented in this paper was the only one which measured and compared nursing home staff inputs, subsequently monetized (on the basis of a 35-hour shift, or 2100 min/week), between SCUs and non-SCUs. The issue of possible differences in costs of staff inputs made in SCUs, as contrasted with counterpart costs in traditional care units, is particularly important for several reasons. First, staff inputs account for over 80% of the total costs of nursing home care.[5–7] Similarly, Mehr and Fries[8] and Fries *et al*.[9] note that staff time expenditures constitute the largest component of cost of care that relates directly to the characteristics of individual residents. Second, in addition to the stipulation that SCUs house only residents with dementing illness, the majority of definitional criteria usually applied in making a distinction between SCU and traditional care are staff related.[10] Adhering to the view of SCUs as a separate form of nursing care, one would expect there to be higher staff ratios, more staff time spent in therapies and in staff support and supervision, and more time spent in case management, including reporting and planning. Third, staff inputs are the most immediately malleable major component of nursing home care: staff ratios, assignments and patterns can be changed, overnight, at will. This is to be contrasted with environmental changes, which take far more time to plan and implement. Thus, an examination of the actual time spent by various categories of staff, particularly as they relate to the characteristics of individual residents, is of paramount importance.

The aim of this analysis was to relate the distinction between SCUs and non-SCUs to possible differences in inputs made by major categories of care providers; this could lead, in turn, to estimates of the personnel costs associated with the alternative care modalities. Because of the exploratory nature of this research, no directional hypotheses were stated, although the implicit expectation was that there would be a positive relationship between SCU status and receipt of more services, and evidence of enhanced specificity of services, e.g., more physical and speech therapies, and more activity worker time. The expectation was that SCU placement would be accompanied by increases in all categories of services.

Method

Staff Input Data

Most frequently, data are collected in the form of (i) administrative records (e.g., numbers of staff), (ii) direct observations (e.g., time and motion studies usually conducted by trained observers with time recording devices, and work sampling, in which random work *occasions* are timed), (iii) diaries or logs (maintained by the service providers) and (iv) retrospective recall by key informants. Despite the availability of these approaches, the collection of individual resident service data has remained problematic because fundamental measurement requirements are not fulfilled.[11–14] For a complete discussion of the relative merits of the different approaches, see a recent article by Holmes *et al*.[15]

Service Input and Cost Data

In view of problems (sources of bias) associated with traditional methods for collecting staff input data, the author developed (with support from the Health Care Financing Administration and the National Institute on Aging) a system ('InfoAide') with which each service provider could automatically record the amount of time spent providing each of a list of services to specific residents.[16,17] In brief, InfoAide generates and uses barcoded service sheets which, in conjunction with a portable barcode reader and accompanying database management system, records and generates data on *what* is provided, *by whom*, *to whom*, *for how long*. The barcoded sheets contain a list of routinely provided services common to the care of nursing homes residents, as listed in **Table 1**. Each service category is accompanied by two barcodes: one appearing in a 'start' column, the second appearing in the 'finish' column. The user (who has logged his/her ID number into the portable scanner at the beginning of the shift) records each occasion of service delivery by sweeping the resident ID barcode, followed by the particular

Table 1. Service categories (both direct and indirect) reflected in the barcoded service sheets

Resident specific		Non resident specific
Personal hygiene	Counseling	Inservice training
Bathing	Resid. discussion	Staff meetings
Toileting	Care planning	Supply
Changing	MDS assessment	Rounds
B&B training	Non-MDS assess.	Break
Making beds	Walking	Off-unit
Nutrition/feeding	Transport	Monitoring
Medications	Wheeling	Recreation
Treatment	Transfer	Pass nourishment
Elimination	Range of motion	Documentation
Vital signs	Turning	
Behavior mod	Miscellaneous	
	Restraints	

service 'start' code or 'finish' code, as the case may be. At the end of the shift, these data are downloaded to a laptop computer, and the database management system takes over.

Because barcode sweeping becomes part of the service-providing act, InfoAide is less prone to the biases associated with other techniques for data collection. Moreover, internal monitoring routines self-identify occasions in which an unrecorded action is likely to have occurred. As reflected below in **Table 1**, barcoded services reflect both direct and indirect categories of service. This system is described in greater detail in a recent article by Holmes *et al.*, which also presents data in support of the system's validity.[18]

Resident characteristic data already had been collected by trained staff persons as part of the study of SCU impacts; thus, for the analyses discussed in this paper it was necessary only to articulate the two data sets.

These input data (expressed in minutes of service) were monetized, using the median weekly reimbursement rate made available by the United States Bureau of Labor Statistics.[19] This conversion provided a uniform basis for comparison between care modalities; it could be performed using local wage and salary information.

Procedures

Aides were trained to use the datawands during a two-day trial period. Data were collected for seven days, during all shifts. Research staff were present during all data collection periods; they monitored all inputs for compliance, and were generally available to answer questions, to download datawands, and to assist in whatever way they could. Data were downloaded from datawand to computer at the end of each shift, at which time a report would be generated indicating possible collection 'exceptions', e.g., service initiation with no termination. These reports were reviewed immediately by the staff person, who discussed seeming anomalies with the service provider before s/he began the next shift, as a means to effecting corrections, where possible, and pinpointing areas in which additional training might be needed in order to avoid future anomalies. Although this level of monitoring is not necessary for routine use of the system, given that this was a research project, considerable 'excess' care was given to all aspects of data collection.

Resident Characteristics Data

Other resident-level data (including ADL, behavior and cognition) were collected by trained research staff, who visited each site for three to four weeks of intensive data collection through direct resident interviews, staff interviews and questionnaires and chart data abstraction. Some of the measures used were those developed, adapted or adopted as part of the common-core measurement protocol developed for the NIA cooperative studies of dementia care; others were well known assessments, such as the Mini Mental Status Exam (MMSE).[20] Impairment in activities of daily living (ADL) was estimated using data from the Minimum Data Set (MDS+);[21] the MDS+ is a federally mandated screening tool for all nursing home residents, and is aimed at identifying care planning elements in 13 broad care areas: medical history, conditions and status; functional health; sensory and physical impairments; nutrition; special treatments and procedures; psychosocial status; discharge potential; dental condition; activity potential; rehabilitation potential; cognitive status; and drug therapy. The entire MDS+ must be completed upon admission, annually and whenever the resident experiences a significant change in health status. A core set of items must be completed on a quarterly basis.

Other measures used in this analysis were obtained through direct interviews, using the CARE (Comprehensive Assessment and Referral Evaluation), developed by Gurland *et al.*[22–24] The INCARE (institutional version of the CARE) was developed from a series of cross-national institutional studies conducted in 1977–1979.[25] The INCARE includes a multilevel–multisource data collection protocol, which made it possible to assess all residents, whether cognitively impaired or not.

Sample

Staff barcoded service data were collected from a total of ten randomly selected nursing homes (five with SCUs, five

without SCUs) located in New York State. In facilities with an SCU, a sample of 20 residents was taken from the SCU and measures of cognitive and functional impairment were collected by trained staff interviewers. The average MMSE score was calculated for the SCU sample and used to select the traditional unit in the facility which best matched the level of cognitive impairment of the SCU. This always turned out to be the unit with the most cognitively impaired residents. Twenty residents were then randomly selected from the traditional unit, yielding a total of 40 residents from each facility. For ease of implementation, the barcoded service information was collected not on just the samples, but on all residents of both units. In facilities without an SCU, the average MMSE score for each unit was examined and the two units most similar to SCUs in terms of levels of cognitive impairment, i.e., whose residents had the highest average cognitive impairment scores as measured by the MMSE, were chosen for the staff input study. Twenty residents were randomly selected from each study unit (total $n = 40$ per facility). In all cases, random selection (first of facilities, then of residents within facilities) was accomplished through application of a pseudo-random selection program offered as part of the software package SPSS.[26]

It was possible to collect staff data and accompanying complete personal care data for a total of 336 of the 400 selected residents, reflecting an overall response rate of 84%. 'Non-participants' included residents whose primary language was other than English or Spanish, who were too physically ill to be interviewed and who had died or been transferred to a hospital prior to collection of all their respective data. Additionally, some units contained fewer than 20 residents who fulfilled study inclusionary criteria. Among these, 237 were in traditional units and 99 in SCUs. SCU residents were slightly older (85.3 years versus 82.8 years, $p < 0.05$), were more cognitively impaired (pro-rated MMSE indicating, on average, 'severe' versus 'moderate' dementia, $p < 0.01$) and were no different from their non-SCU counterparts in terms of ADL functioning (both were, on average, dependent with an intermediate level of impairment) and both included approximately 70% females. Given the finding that there were no statistically significant differences between SCU and non-SCU residents in terms of functional impairments, subsequent analyses adopted the view that the possible effects of systematic differences in co-morbidities were mooted by the random selection of facilities and of subjects within the units. However, SCU status was related to some factors, eg., behavior. Multivariate analysis was conducted, adjusting for non-equivalence by entering cognitive status and age as covariates, together with measures of co-morbidities such as visual and hearing disorder.

Method of Data Analysis

An introductory step involved the generation and inspection of frequency distributions and item characteristics for each of the variables. As a result of this preliminary review, in order to normalize distributions, transformations were performed on several of the variables, including logarithmic transformations of the cost data in order to correct for positive (right) skew which was found with respect to most personal categories.

The overall aim of the analyses was to examine the relationship between SCU and non-SCU status in terms of personnel costs for each of the major categories of service provider in nursing homes, while taking into account individual resident characteristics. Clearly, this calls for some form of multivariate analysis, in which care cost for each category is treated as the dependent variable. Thus, for example, one analysis might focus on nursing aides: whether or not there is a relationship between SCU placement and cost of nursing aide care, taking into account such factors as individual resident ADL function, behavior problems, cognition and demographic characteristics.

The first step in this analysis was to determine whether or not there was a significant relationship among the dependent (personnel cost) variables; while multiple-regression (MR) analysis would be appropriate for non-correlated dependent variables, multivariate analysis of covariance (MANCOVA) would be required in the case of correlated dependent variables. Model assumptions and fit were examined in order to increase the odds that resulting estimates would be unbiased. All models were hierarchical, using a direct-entry procedure and ordering variables in terms of the presentation in the tables.

Results

The intercorrelations among dependent variables are shown in **Table 2**. Examining first the zero-order correlations of the dependent variables with SCU status, it is evident that the magnitude is small; the highest correlation is for the category 'aides'. 'LPN' and 'Speech' also correlate significantly (0.15 and 0.19). Of interest is the significant negative correlation of 'Activities' and 'Physical therapy'. It appears that higher imputed expenditures associated with provision of these services is associated with non-SCU status.

As may be seen in **Table 2**, there are two groups of dependent variables: (i) aide, licensed practical nurse (LPN) and registered nurse (RN); and (ii) social work, dietician and occupational therapist. Accordingly, these two groups were examined in separate MANCOVAs. The four remaining types of personnel (physician, physical therapy, speech therapy and therapeutic activities) were not significantly related to one another or to other variables, and therefore were examined using multiple-regression analysis.

A next question relates to possible collinearity among covariates reflecting personal characteristics, reflected in **Table 3**. As may be seen in **Table 3**, most of the correlations are very low. While there are substantial correlations between cognitive functioning (MMSE) and ADL, behavior disorder and affect, and between behavior disorder and affect, none of these are so high as to suggest collinearity, i.e., all are below 0.60. In fact, subsequent examination of collinearity diagnostics (variance inflation factors (VIFs)) supports this view. VIFs are relatively small (most are between 1

Table 2. Intercorrelations of raw (non-transformed) cost variables ($n = 321–336$)

	Aide	LPN	RN	Soc.	MD	OT	PT	Spch	Diet	Activ
LPN	0.35**									
RN	0.26**	0.40**								
Soc.	0.03	–0.07	–0.11*							
MD	0.03	0.05	0.08	0.00						
PT	0.10	–0.01	0.05	0.11	0.02					
OT	–0.03	–0.07	–0.05	0.17**	–0.06	0.11*				
Spch	0.07	0.11	–0.01	0.06	0.08	–0.04	0.11			
Diet	0.06	0.11	0.03	0.17*	0.04	0.10	0.04	–0.10		
Activ	–0.12	–0.02	–0.12*	–0.02	–0.04	–0.06	0.09	0.00	0.01	
SCU	0.24**	0.15**	–0.06	0.11	–0.07	–0.08	–0.17**	0.19**	–0.02	–0.15**

* $p \leq 0.05$ for two-tailed test.
** $p \leq 0.01$ for two-tailed test.
Key to staff categories:

Aide	certified nurse's aide
LPN	Licensed Practical Nurse
Soc	Social worker
MD	Physician
PT	Physical therapist
OT	Occupational therapist
Spch	Speech therapist
Diet	Dietician
Activ	Activity/therapeutic activity worker

Table 3. Intercorrelations of personal characteristics ($N = 321–336$)

	Age	Sex	MMSE	ADL	Hear	Vision	Behav	Affct	Rstrn
Sex	0.32**								
MMSE	0.20**	0.08							
ADL	0.17**	0.14*	0.52**						
Hear	0.22**	0.04	0.02	0.07					
Vision	0.20**	0.09	0.19**	0.22**	0.25**				
Behav	–0.01	–0.02	0.50**	0.29**	–0.02	0.07			
Affct	0.13	0.08	0.52**	0.35**	0.01	0.12*	0.45**		
Rstrn	0.11	–0.03	0.27**	0.34**	0.02	0.05	0.19**	0.24**	
SCU	0.11	0.06	0.12*	0.05	0.10	0.13*	0.14**	0.10	0.17**

* $p \leq 0.05$ for two-tailed test.
** $p \leq 0.01$ for two-tailed test.
Key to selected (abbreviated) variables.

MMSE	Mini-Mental State Examination[20]
ADL	Activities of daily living
Hear	Hearing impairment
Vision	Visual impairment
Behav	Disturbing/deviant behavior(s)
Affct	Emotional affect
Rstrn	Physical restraint application
SCU	Special Care Unit/non-special Care Unit status

and 1.5). (For discussions of regression diagnostics and collinearity, see Beale *et al.*,[27] Kenny[28] and Fox.[29]) Initially, incontinence had been included in the data set; however, this variable correlated well over 0.60 with several of the variables shown in **Table 3**, and results in large VIFs; it was therefore excluded from further analyses.

Shown in **Table 4** are the results of the MR analysis of the four non-related dependent variables. Dealing with the staff categories in order of their presentation, with respect to speech therapy the only variable associated with cost of input is SCU/non-SCU status ($p \leq 0.01$), although the prediction equation, overall, is not significant. Significantly more imputed expenditures for staff are associated with SCU residents. The same is generally true of physical therapy (SCU/non-SCU difference significant, $p \leq 0.01$), although this time the regression equation is significant ($p \leq 0.05$), and is in the opposite direction. More imputed expenditures are associated with non-SCUs. Resident age is predictive of cost of physician care ($p \leq 0.01$), as is hearing ($p \leq 0.05$); however, although the overall regression equation is significant ($p \leq 0.05$), SCU/non-SCU status is not a significant predictor. Among therapeutic activity workers, no individual predictor is significantly related to cost of care input although, cumulatively, the regression equation is significant ($p \leq 0.01$).

Turning now to the MANCOVAs of related dependent

Table 4. Results of multiple regressions of non-correlated dependent cost variables (physical therapy, speech therapy, physician and therapeutic activities), with prior entry of covariates (values are beta) ($N = 336$)

	Speech therapy		Physical therapy		Physician		Activities	
Variable	*B* (SE)	Beta	*B* (SE)	Beta	*B* (SE)	Beta	*B* (SE)	Beta
Age	–0.001 (0.004)	0.010	0.001 (0.002)	0.031	–0.008 (0.003)	–0.186**	–0.006 (0.004)	–0.092
Gender	–0.010 (0.087)	–0.006	0.020 (0.050)	0.023	–0.058 (0.060)	–0.055	–0.040 (0.094)	–0.024
MMSE	–0.003 (0.022)	–0.011	–0.014 (0.013)	–0.084	0.014 (0.015)	0.071	–0.036 (0.024)	–0.111
ADL	0.013 (0.017)	0.050	0.013 (0.010)	0.090	0.016 (0.012)	0.088	–0.022 (0.019)	–0.078
Hearing	0.051 (0.094)	0.031	–0.002 (0.054)	–0.002	0.128 (0.064)	–0.113*	–0.144 (0.101)	–0.080
Vision	–0.011 (0.052)	–0.013	–0.007 (0.030)	–0.14	–0.15 (0.036)	–0.24	–0.061 (0.056)	–0.062
Behavior	0.026 (0.050)	0.034	–0.041 (0.029)	–0.095	0.004 (0.034)	0.008	–0.051 (0.054)	–0.061
Affect	–0.089 (0.071)	–0.082	0.022 (0.041)	0.036	–0.007 (0.049)	–0.010	0.066 (0.077)	0.056
Restraint	–0.123 (0.092)	–0.080	–0.020 (0.053)	–0.022	–0.102 (0.063)	–0.095	0.053 (0.099)	0.031
SCU/non-SCU	0.248 (0.078)	0.179**	–0.137 (0.045)	–0.171**	–0.013 (0.054)	–0.014	–0.156 (0.084)	–0.102
Adjusted R^2; equation sig.		0.01		0.03*		0.03*		0.06**

* $p \leq 0.05$; ** $p \leq 0.01$, two-tailed test.

variables, the first analysis, including nursing aides, licensed practical nurses (LPNs) and registered nurses (RNs), is shown in **Table 5**.

The overall multivariate group effect is significant ($F = 6.43$, $p < 0.01$). The group effect is significant for the aide and LPN dependent variables. SCU imputed expenditures for aides and LPNs are significantly higher than non-SCU expenditures, after controlling for resident-level differences between SCUs and non-SCUs. The cost of aide care is significantly, positively related ($p \leq 0.01$) to SCU/non-SCU status. Cognitive impairment, ADL impairment and being restrained are also related to higher aide care cost ($p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.05$, respectively).

The cost of LPN care is similarly related to SCU/non-SCU status ($p \leq 0.01$), and to ADL impairment ($p \leq 0.01$). However, cognitive impairment is not a significant covariate, while there is a (negative) relationship between age and cost of LPN care: the younger the resident, the more costly the care.

Among RNs the picture changes somewhat, although ADL impairment still emerges as a highly (and the only) significant covariate ($p \leq 0.01$). However, there is no difference between SCUs and non-SCUs in terms of cost of RN care. This may be explained by the low power associated with the individual dependent variable multivariate *F*-tests. This low power is attributable, in turn, to two factors. First, the effect sizes are small. Expressed either in terms of differences in the amount of care given in the two settings, or of variance attributed to the SCU/traditional dichotomy, the unique explanatory power of SCU membership is small. Second, the variability of some of the dependent measures is small. For example, using aide expenditures as the example because it is the variable with the best fit, the unique contribution of SCU/traditional status to explaining aide expenditures is only 0.03. The difference between the groups on the log-transformed SCU/traditional means is 0.19 units. The difference between the groups on the non-transformed cost variable is about $2.00 per day. Thus, although the SCU/traditional dichotomy correlates 0.24 (accounting for 6% of the variance in aide expenditures after controlling for other variables) it explains only 3% of the overall variance. Altogether, 34% of the variance (adjusted $R^2 = 0.37$) in aide expenditures is explained by the covariates in the model; unexplained is 63% of the variance.

The second MANCOVA, in which imputed expenditures of social workers, dieticians and occupational therapists constitute the dependent variables, is reflected in **Table 6**. The overall multivariate group effect for the second MANCOVA was also significant ($F = 7.52$, $p < 0.01$). The group effect is significant for the social worker and dietician dependent variables.

Among social workers, although the distinction between SCU and non-SCU is significant ($p \leq 0.01$), in a positive direction, i.e., greater imputed social work time as reflected in expenditures provided in SCUs, none of the covariates are associated with SCU/non-SCU status.

Among dieticians there is also a significant ($p \leq 0.05$)

Table 5. MANCOVA examining SCU group effects on costs of care provided by aides, licensed practical nurses and registered nurses, respectively, adjusting for covariates ($n = 326$) (personal variables scored in the deviant direction: the higher the score, the greater the impairment)

	Aide			Licensed practical nurse			Registered nurse		
	Beta	β Se (β)	C.I.[a]	Beta	β Se (β)	C.I.[a]	Beta	β Se (β)	C.I.[a]
Age of resident	0.046	0.002 (0.002)	0.007; 0.004	0.171**	0.011 (0.004)	0.022; 0.001	0.026	0.002 (0.005)	0.017; 0.012
Sex of resident	0.014	0.014 (0.046)	0.114; 0.143	0.007	0.011 (0.088)	0.259; 0.237	0.072	0.153 (0.119)	0.183; 0.490
Cognitive level (MMSE)	0.130*	0.025 (0.012)	0.008; 0.057	0.083	0.026 (0.022)	0.037; 0.088	0.011	0.004 (0.030)	0.089; 0.080
Activities of daily living (MDS)	0.418**	0.071 (0.009)	0.045; 0.096	0.182**	0.049 (0.017)	0.000; 0.098	0.319**	0.116 (0.024)	0.049; 0.183
Hearing (log transformed)	0.039	0.042 (0.049)	0.096; 0.179	0.068	0.101 (0.094)	0.368; 0.164	0.047	0.109 (0.128)	0.252; 0.469
Vision	0.012	0.007 (0.027)	0.083; 0.070	0.087	0.081 (0.053)	0.067; 0.230	0.016	0.020 (0.071)	0.181; 0.221
Disturbing behavior (log trans.)	0.083	0.041 (0.026)	0.033; 0.115	0.012	0.010 (0.051)	0.152; 0.133	0.036	0.038 (0.068)	0.155; 0.231
Affect	0.028	0.020 (0.037)	0.085; 0.125	0.006	0.007 (0.072)	0.196; 0.209	0.031	0.020 (0.097)	0.294; 0.254
Restrained during interview	0.111*	0.111 (0.048)	0.024; 0.246	0.011	0.018 (0.093)	0.279; 0.243	0.082	0.178 (0.125)	0.531; 0.175
Univariate *F*-tests	$F = 9.611$ $p < 0.01$; E.S. = 0.03; power = 0.881			$F = 9.223$ $p < 0.01$; E.S. = 0.03; power = 0.856			$F = 131$ $p =$ NS; E.S. = 0.001; power = 0.48		
Bartlett Box *F*	$F = 0.16$ $p = 0.68$			$F = 0.14$ $p = 0.71$			$F = 3.041$ $p = 0.08$		
Adjusted *R*-square (from multiple-regression analyses)	0.37			0.08			0.08		

*$p \leq 0.05$; ** $p \leq 0.01$, two-tailed tests.
[a] Lower and upper 95% confidence intervals.
Box's M *F* statistic = 4.488; $p \leq 0.01$.
Bartlett test of sphericity: 59.31 with 3 df, $p \leq 0.01$.
Pillais multivariate *F* for effects of SCU/non-SCU: 6.433 for 3 323 df, $p \leq 0.01$.
Power and effect sizes are for multivariate effects of group (SCU/traditional) on the dependent variables.

Table 6. MANCOVA examining SCU group effects on costs of care provided by social workers, dieticians and occupational therapists, respectively, adjusting for covariates ($n = 326$) (personal variables scored in the deviant direction: the higher the score, the greater the impairment)

	Social workers			Dieticians			Occupational therapists		
	Beta	β Se (β)	C.I.[a]	Beta	β Se (β)	C.I.[a]	Beta	β Se (β)	C.I.[a]
Age of resident	0.011	0.001 (0.005)	0.014; 0.016	0.149**	0.008 (0.003)	0.018; 0.001	0.001	0.000 (0.004)	0.012; 0.012
Sex of resident	0.020	0.041 (0.122)	0.386; 0.303	0.043	0.057 (0.077)	0.275; 0.161	0.001	0.001 (0.102)	0.287; 0.288
Cognitive level (MMSE)	0.017	0.006 (0.031)	0.094; 0.080	0.036	0.009 (0.019)	0.064; 0.045	0.166*	0.057 (0.026)	0.129; 0.015
Activities of daily living (MDS)	0.015	0.006 (0.024)	0.074; 0.062	0.053	0.012 (0.015)	0.031; 0.055	0.146*	0.044 (0.020)	0.013; 0.101
Hearing (log transformed)	0.107	0.246 (0.131)	0.123; 0.616	0.011	0.016 (0.083)	0.249; 0.218	0.073	0.139 (0.109)	0.448; 0.169
Vision	0.089	0.113 (0.073)	0.319; 0.093	0.051	0.040 (0.046)	0.171; 0.090	0.012	0.012 (0.061)	0.184; 0.159
Disturbing behavior (log trans.)	0.115	0.123 (0.070)	0.075; 0.321	0.071	0.048 (0.044)	0.077; 0.173	0.065	0.058 (0.058)	0.107; 0.223
Affect	0.060	0.091 (0.100)	0.372; 0.190	0.093	0.089 (0.063)	0.089; 0.266	0.115	0.144 (0.083)	0.090; 0.378
Restrained during interview	0.022	0.048 (0.128)	0.410; 0.314	0.011	0.015 (0.081)	0.214; 0.244	0.048	0.086 (0.107)	0.215; 0.388
Univariate *F*-tests	$F = 9.910$ $p < 0.01$; E.S. = 0.03; power = 0.879			$F = 3.908$ $p < 0.05$; E.S. = 0.01; power = 0.502			$F = 1.990$ $p =$ NS; E.S. = 0.006; power = 0.289		
Bartlett Box *F*	$F = 0.33$ $p = 0.86$			$F = 0.546$ $p = 0.46$			$F = 8.78$ $p \leq 0.001$		
Adjusted *R*-square (from multiple-regression analyses)	0.03			0.03			0.02		

$p \leq 0.05$; ** $p \leq 0.01$, two-tailed tests.
[a] Lower and upper 95% confidence intervals.
Box's M F statistic = 2.097, $p \leq 0.05$.
Bartlett test of sphericity: 49.21, df = 3, $p < 0.01$.
Pillais multivariate F for effects of SCU/non-SCU: 7.518 for 3 323 df, $p \leq 0.01$.
Power and effect sizes are for multivariate effects of group (SCU/traditional) on the dependent variables.

relationship between SCU/non-SCU status and cost of care input, although the difference is in the opposite direction, i.e., less dietician time and associated expenditures is given in SCUs. Similarly, the older the resident, the less dietician time s/he receives ($p \leq 0.01$).

Among occupational therapists, there is no relationship with SCU/non-SCU status. In terms of covariates, the more cognitively impaired the person, the less occupational therapy s/he receives ($p \leq 0.05$); the more ADL impaired, the more therapy received ($p \leq 0.05$).

Discussion

Several major questions are addressed by these analyses. First, is there an overall relationship between personnel cost of care according to SCU status, i.e., whether a resident is a resident of an SCU or a traditional unit? The answer is a guarded 'yes', while recognizing that this does not hold for all categories of personnel. Moreover, particularly as is suggested by the cumulative proportion of explained variance shown in the MR analyses, SCU/non-SCU status, even when combined with the central resident covariates, explains very little of the variance in service costs, other than with respect to nursing aides; in a separate MR analysis in which aide (monetized) time was the dependent variable, the cumulative adjusted R^2 was 0.37; for each of the other categories of service provider, the adjusted R^2 was less than 0.10. The absence of any major differences in service provision between SCU and traditional care is itself an important finding, with major implications for the shaping of services to demented residents of nursing homes.

Generally speaking, there were differences (particularly in cognitive and ADL impairment) between SCU and non-SCU residents; these differences were related to differences in basic services which were, in turn, provided primarily by aides. Thus, a certain level of care reflected in more aide time for SCU residents is provided, sufficient to fulfil fundamental needs of the residents. However, there is relatively little variation in what might be termed 'elective' services, according to individual characteristics or placement in special care (although the differences are sufficient to achieve statistical significance). This absence of substantial relationship is important, in that it suggests that either (i) 'special care' is illusory—perhaps little more than a marketing misnomer, or (ii) that the distinction between implicitly monolithic entities (SCU versus non-SCU) care is misplaced, and that more attention should perhaps be accorded to a gradation of targeting and tailoring of services, itself more reflective of individual and often unique gradations of impairment and need.

A second question relates to whether level of cognitive impairment is required as a variable when predicting service cost, i.e., whether variation in cost can be explained solely by variation in ADL impairment, suggesting that reimbursement should not be tied to level of cognitive impairment. The results here suggest otherwise, i.e., although ADL impairment was strongly related to care input costs, so also was cognitive impairment (positively and uniquely related) to costs of services provided by nursing aides (who are responsible for most of resident care), and (negatively) related to costs of services provided by occupational therapists. A remaining task is to aggregate these costs, in different reimbursement climates, i.e. different regions of the country or different countries, in order to determine whether there is a difference in total cost. For example, although the more demented the resident, the more aide care received, this is relatively inexpensive care, and, thus, the difference might be overshadowed by the absence of any such relationship among more costly caregivers, e.g., physicians. Moreover, there can be major variations among countries in personnel reimbursement rates; thus, for example, while in the United States personnel costs account for approximately 80% of nursing home direct costs,[5] the figure might be far less (or greater) in other countries.

A third question relates to the tailoring of care to individual needs.[30] On the one hand, a significant positive relationship between imputed expenditures and SCU status was observed for social work and speech therapy. On the other hand, one might expect, for example, that therapeutic recreation workers, or occupational therapists, or physical therapists, or dietary staff might invest more time in residents living in special care units where, after all, special attention is supposed to be devoted to responding to individual needs of residents. The absence of such relationships—and even negative multivariate relationships in the case of physical therapy and dietary, and negative univariate relationship in the case of activities—raises questions as to what is 'special' about special care—at least in terms of patterns of ancillary caregiving, i.e., services and attention which go beyond the basics of care. A basic, explicit premise of 'special' care is that it is more closely attuned to the individual needs of different residents. Accordingly, one would expect to see a positive relationship between SCU placement and expenditures for therapies (occupational, physical and speech), for social service (in case planning) and in therapeutic recreational activities. While this was observed for social work and speech therapy, the current data appear to belie these expectations, at least with respect to personnel inputs reflecting occupational, physical and activity therapies, which are a major component of special care cost.

The principal limitations in the analyses reflected in this paper are that (i) they are cross-sectional, and (ii) as a result, they cannot take into account possible differences in *resident outcomes* which may be associated with SCU/traditional unit status. Using additional data which reflect the administration of all measures at three points in time, these limitations will be addressed, using analytic techniques such as random effect modeling which take into account differences among subjects in terms both of baseline status and of differing rates of change of outcome measures.

These limitations aside, this research and these findings cut directly to the core of questions regarding health care policy as it applies to the care of nursing home residents with dementing illness. As noted by several authors,[4] policy planners and administrators are in need of objective data which either support or refute the relative utility of special

dementia care. Fundamental questions, i.e., as to relative cost and relative impact, were, until the mid-1990s, not addressed in any comprehensive fashion. Results reported here are among the first which have emerged from the National Institute on Aging collaborative studies of special dementia care. Suggesting that there are only minor SCU/traditional care differences in terms of services provided, these results will be important in making policy decisions. For example, expenditures are less explained by the SCU/traditional dichotomy than they are by characteristics of unit residents; therefore, if there are programming and staffing differences, they are not reflected in the organizational dichotomy. These results underline the need for additional analyses and research dealing with individual resident variables and their relation to the substance and structure of dementia care. This, in turn, will provide the information needed for decisions regarding allocation of resources and the shaping and delivery of services to elderly persons in residential health care facilities.

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