Title
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STAFFING PATTERNS AND HOSPITAL EFFICIENCY

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ABSTRACT

The objective of this study was to assess the effect of four different nurse staffing strategies on hospital costs: Part-time RNs; RN temporary agencies; RN rich skill mix; and organizationally experienced RNs. Two regression equations were specified to consider the effect of these strategies on personnel and benefit costs and on non-personnel operating costs. A number of additional variables were also included in the equations to control for the effect of other organization and environmental causes of hospital costs. Consistent with the hypotheses, use of part-time RNs and experienced staff reduced personnel and benefit costs while the use of temporary agencies for RNs increased non-personnel operating costs. An RN rich skill mix was not related to either measure of hospital costs. The implications of our findings for hospital administration are discussed.

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INTRODUCTION

Over the last decade American hospitals have had to address the issue of production efficiency with new vigor. This is true for several reasons: 1) cost containment policies of both private and government health insurers; 2) emergence of stricter controls over what private health insurance will reimburse; 3) increasing competition among hospitals, and 4) intermittent shortages in the supply of professionals needed to deliver health care.

One of the ways hospitals have responded to these threats to their fiscal survival has been to consider staffing strategies that achieve optimal production efficiencies. For purposes of this discussion, production efficiency is the extent to which resources (e.g. labor, supplies or other inputs) are minimized in producing a given output. Registered nurse (RN) staffing is a major factor in ensuring hospital production efficiency because nurses directly participate in the core technology of hospitals, the delivery of patient care, and represent a significant portion of a hospital's operating budget. In other words, registered nurses contribute to and are accountable for productivity as it pertains to patient care (Fottler et al., 1988).

In practical terms, RN staffing patterns may affect production efficiency in several arenas through: 1) reduced administrative costs due to the use of temporary agency nurses which may be offset by the increased costs of scheduling orienting, and managing this group of nurses; 2)increased costs of benefits for part-time nurses; 3) increased operating costs due to reduced productivity of temporary agency nurses and 4) increased payroll costs associated with staffing patterns that reflect high proportions of registered

nurses.

The objective of this study is to assess the impact of RN staffing strategies on the efficiency of the hospital organization; specifically, to evaluate the impact of four staffing strategies on hospital cost.

Staffing Strategies

In general, nursing staffing strategies consist of generic approaches such as core staffing and using temporary and part-time staff to support variable demand based on occupancy rates and patient acuity. Complementing such generic strategies have been targeted staffing approaches which take into account the skill mix of nursing and non-nursing personnel and the authority relations between the staff. In addition, some hospitals by virtue of their location or specific policies emphasized different mixes of experience and tenure among their nursing staffs. We examine four staffing strategies in this study: 1) the use of part-time nursing staff, 2) use of temporary, contract, nursing services (registries), 3) skill mix of nursing staff and 4) tenure experience mix of nursing staff.

Resource use is a focal issue in planning staffing strategies. For example, in previous decades the maintenance of a full time staff was the dominant consideration when hiring nurses for the hospital nursing services. However, as more women returned to, or never left, the labor force following marriage and child rearing, there was greater demand for part-time opportunities. Since occupancy rates vary over the course of the year, the use of part-time career staff and per diem staff, provide mechanisms to respond to this variability. Part-time career staff are paid benefits and are viewed by nursing administration as hospital employees while per diem nurses may be paid more in lieu of benefits and are not viewed as hospital employees.

Many hospitals have taken advantage of these staffing strategies to achieve more flexibility in the allocation of staff resources, thus, potentially increasing production efficiencies and reducing costs.

Part-time career nursing staffs provide a solution to the variability of occupancy rates. When occupancy rates are low, they are often more willing to work fewer hours and when rates are high they can increase their hours without costing the hospital overtime. Whether the potential savings from reduced overtime costs are reduced by increased benefits is unclear. Part-time staff who work less a fixed percent, generally 50 percent time, may not receive sick leave, vacation, and insurance benefits. However, hospitals who hire part-time "career" staff who work greater than 50 percent time may cost more as the fringe benefits are paid as if the individual was working full time, doubling the costs of such benefits (Wakefield and Mathis, 1985). Thus, we expect that the use of part-time nursing staff will lead to reduced payroll costs. The effect on payroll and benefits is specified below.

H 1. The greater the proportion of part-time to full time staff, the lower the hospital's personnel costs.

Temporary staff hired through temporary agencies (registries) receive their benefits from the agency rather than the hospital. The employing hospital pays a fixed amount per shift at a reputed savings of four to five percent relative to what it would cost to use regular career staff. Other touted advantages to hospitals using temporary agency staff are elimination of the need for an internal part-time pool, provision of a lever or disciplinary force for management, reductions in managerial time in securing shift coverages and the provision of a backup staff during holidays or emergencies (Amenta, 1977; Coss, 1989).

Alternatively, however, many also cite the disadvantages of temporary agency staff such as uneven quality of personnel, the lack of familiarity with the unit and the institution resulting in lower productivity and ultimately in poor quality of care (Amenta, 1977; Coss, 1989). When temporary agencies are used to fill temporary vacancies due to illness and vacations, staff salaries and benefits are not eliminated; the cost saving dues to the use of temporary agency personnel only accrue when the hospital is filling vacant, budgeted positions (Norrish, 1992). Since costs for agency personnel are based on contracts with temporary agencies, costs of registry staff should increase hospitals' non personnel operating costs. The following hypothesis can be specified:

H 2. The greater the use of temporary agency personnel, the higher the hospital's non personnel operating costs.

In addition to the proportion of part-time and temporary agency staff utilized by the hospital, skill mix of registered nurses and other nursing staff [vocational (practical) nurses and nursing assistants] also affects the amount of resources consumed by the hospital. Different hospital services may require different skill mixes. For example, intensive care units and coronary care units are characteristically staffed with high ratio of nurses to patients and with registered nurses. Lower ratios and skill mixes may be found on medical and surgical units. Despite such internal staffing patterns, hospitals will vary with respect to the emphasis they place on the ratios of registered nurses to total nursing staff. Whether high ratios of registered nurses are more costly to the hospital has been a topic of extensive debate. Advocates of a all-RN staff, or a rich mix of RNs to other nursing personnel, cite the greater flexibility of registered nurses, reduction in supervisory

time needed when there are few nursing assistants and vocational nurses to supervise, and greater productivity among all-RN staffs (McCormick, 1986; Halloran, 1983a). Evidence for cost-effectiveness of all RN-staffs, however is inconsistent. Halloran (1983b) compared nursing care on a unit with a predominantly (72%) registered nurse staff and one in which 40% were registered nurses, 40% were aides and 20% were licensed practical nurses. The personnel costs of the predominantly registered nurse staff were lower per shift than the unit with the greater skill mix yet the proportionately smaller staff of registered nurses gave more effective care. In contrast, The National DRG Nurse Costing Study" which used data from 80,000 records from twenty-two Medicus client hospitals ranging in size from 202 to 1,181 beds, failed to find a correlation between nursing staffs with high percentages of RNs and lower costs (McCormick, 1986). In fact, another analysis of Medicus Systems Corporation's National Comparative Data Base, utilizing unit level information from 392 medical and surgical nursing units in sixty-two U.S. hospitals, found that nursing staffs with a high percentage of RNs were more expensive regardless of whether costs were calculated as nursing dollars per patient day, RN dollars per patient day, or nursing dollars per unit of work load (Glandon, Colbert, and Thomasa, 1989). Realizing that support for either argument is sparse, the following hypothesis is tested:

H 3a. The higher the ratio of registered nurses to the total nursing staff (i.e. the richer the skill mix), the lower the hospital costs.

The competing hypothesis is:

H 3b. The higher the ratio of registered nurses to the total nursing staff, the higher the hospital operating costs.

While there is little literature related to the experience level of nurses and its effect on hospital costs, an argument can be grounded in the literature on organizational demography. If professionally trained nurses (RNs) are more productive than less trained nurses, it follows that more experienced nursing staffs should be even more productive and therefore cost the hospital less. Whereas, in most fields that more experienced staffs may cost the organization more in terms of salaries, in hospitals the career ladder has few levels and wage compression is common (Cleland, 1985). To the extent that the salary range for nurses is compressed, it does not cost the hospital much more to have an experienced staff. The potential savings in terms of productivity, orientation, and team development are great. We can therefore hypothesis that:

H 4. The greater the percent of experienced nurses, the lower the costs.

Control Variables

Hospital efficiency is clearly affected by a number of variables besides staffing patterns. Research on hospital efficiency has been extensive and is generally grounded in the field of health economics (Sloan and Steinwald, 1980). It's focus has been to model hospital cost functions, including the inputs, outputs and contextual factors that influence efficiency and costs. Less emphasis has been placed on the internal organizational characteristics of the hospital, such as differences in how the nursing staff is deployed within the organization.

To isolate the relationship between hospital efficiency and staffing patterns, characteristics of the organization and the environment are included in the model as control variables. The selection of such control

variables are based on evidence in the hospital economics literature of a relationship with hospital costs and a potential association with nurse staffing patterns; these control variables represent a competing or alternative explanation of the staffing-efficiency relationship. The control variables were divided into internal organizational characteristics and environmental characteristics. The organizational control variables included organizational size, ownership/control (e.g. church, for-profit), teaching status, operating capacity and input complexity/uncertainty. The environmental controls included geographic region, urban/rural status, regulatory intensity by state, local economic climate, hospital wage rates, hospital competition within a service area, and the supply of nursing labor within the community. These variables are discussed in detail in the measurement section.

METHODOLOGY

Data Sources

The primary source of data for this analysis was the Nurse Personnel Study conducted by the American Hospital Association (AHA) in 1981. This survey was developed to obtain information about vacancies and turnover among hospital nursing personnel. The questionnaire elicited aggregate (hospital level) information on three aspects of the organizations: 1) the numbers of both full and part-time nursing staff for inpatient services, outpatient services and specialty services (intensive care and coronary care), 2) work organization, including wages and fringe benefits, use of temporary agencies and recruitment practices, and 3) orientation practices for nurses. The questionnaire was addressed to the Chief Executive Officer of each hospital

with the expectation that the Personnel Director's Office would assist in completing it. Because of the objective nature of the survey items, subjectivity bias was not a consideration in the data collection process. Telephone follow-up by AHA staff was conducted to ascertain the reliability and accuracy of the data.

Data from two additional sources were merged to the Nursing Personnel Study data file: The 1981 AHA annual survey of hospitals and the Area Resource File. Data from the AHA annual survey of hospitals provided additional information on the hospitals general organizational structure. The Area Resource File provided country-level data on the external environment of the hospital.

The Sample

A 20% random sample (1,222 hospitals) was drawn from a universe of approximately 6,110 hospitals throughout the country. The Nursing Personnel Survey was sent to hospitals in three waves with a telephone follow-up by AHA. AHA Regional Directors were asked to encourage member hospitals to complete and return the questionnaire. These efforts yielded a 59.9% response rate, a sample of 732 hospitals.

For the purposes of this analysis, only hospitals reporting one or more full-time staff RNs were included to minimize magnification of personnel changes in small hospitals. The AHA's preliminary analysis of the Nursing Personnel survey indicated that the response rate was adversely affected by the survey's length and by the complexity of some of the questions. Consequently, cases were lost due to listwise deletion in the multivariate analysis. The final usable sample was 583 hospitals.

To insure that this "subsample" was representative, a comparison was

made to the original sample with regard to hospital size, region of the country, and ownership of the hospital. The subsample and the original sample were closely matched on two of these characteristics, size and ownership. However, in the subsample there was a slight over-representation of hospitals in the Northeast region of the country.

Measurement

To assess the relationship between staffing strategies and organizational efficiency, a consistent output criterion is required (Bluedorn, 1982). For the purposes of this analysis, organizational efficiency will be used as our general output criterion, defined as the ratio of an organization's output to input. This ratio defines increasing efficiency as greater output produced by the same amount of input or the same amount of output produced with less input. For general acute care hospitals, the basic unit of output is the hospital admission. Inputs are measured by both personnel and non-personnel operating costs associated with the production of a unit of output. Such costs include staff, equipment, and facilities used to produce the output.

Two separate measures of hospital efficiency were used as the dependent variables in the analysis: 1) personnel costs per adjusted admission and 2) total non payroll operating costs per adjusted hospital admission. The 1982 AHA annual survey provided data on total operating expenses, total payroll expenses, total benefit expenses, total number of inpatient admissions and inpatient and outpatient revenues for fiscal year 1981. Total operating expenses minus pay and benefit expenses was used to measure non-payroll hospital operating costs of the hospital. Payroll and benefits expenses were combined to measure personnel costs. Expense data for both measures were

standardized by dividing by total hospital admissions. An additional adjustment (1 + the ratio of hospital outpatient revenues to inpatient revenues) was made to hospital admissions in order to take into account the volume of outpatient services. Finally, the natural log of each expense variable was taken to meet the assumptions of normality required by ordinary least squares regression (Chattergee and Price, 1977). The two measures of efficiency are correlated at r = 0.70.

Measures of the major independent variables are: 1) Part-time ratio - the ratio of part-time to full time RNs; 2) the use of temporary agencies- whether or not the hospital used temporary agencies to obtain staff (Yes = 1; No = 0); 3) the use of RN temporaries - the number of shifts filled in one week by registered nurses hired from temporary agencies; 4) Skill mix - the ratio of full time RNs to total nursing staff; and 5) RN tenure - the per cent of RN staff with greater than 5 years tenure.

Seven measures of internal hospital characteristics were included as control variables in the multivariate model. Size of the hospital was defined as the number of hospital beds set up and staffed for use (Cohen, 1967; Carr and Feldstein, 1967). Ownership of the hospital was defined as whether the hospital was an investor owned (for-profit), church-owned (not-for-profit), operated by state or local government, or operated as a voluntary, not-for-profit hospital (Berry, 1970). The voluntary, not-for-profit category was designated the reference group in the multivariate model. A categorical variable, teaching status, measured the existence of medical residency training programs (Sloan, Feldman, and Steinwald, 1983; Hadley, 1983). Efficient use of resources (especially capital expense items) is represented by the average hospital occupancy rate. The variable average hospital length

of stay represented a proxy for patient acuity (Robinson and Luft, 1985). Differences in severity of illness were also controlled for by the HCFA Medicare Casemix Index (Federal Register, 1983). This index scales case mix complexity for individual hospitals to a base of one for hospitals with average case mix complexity. Higher values reflect a more complex case mix while lower values reflect a simpler case mix (Watts and Klastorin, 1980). Finally, the wages for new RNs is measured as the average starting hourly wage for all new graduates (RN) in the focal hospital (Cohen, 1967).

Six environmental variables were also included as control variables. Two measures of hospital location were used: region and urban/rural status. Region of the country was measured by a series of dummy variables corresponding to four geographical regions of the country (South, West, Northeast and North-Central); the Northeast category was omitted as the reference group in the regression analysis. Whether the hospital is located in an urban SMSA or a rural non-SMSA area was measured by a dummy variable (Urban = 1, Rural = 0) (Finch and Christianson, 1981).

The Regulatory Intensity Index (RI) gauges the number and stringency of state regulatory programs affecting hospitals in 1980 (Urban and Bice, 1980; Sloan and Steinwald, 1980; Morrisey et al., 1984). The indicators of RI refer to the characteristics of four regulatory programs: 1) Certificate of need (CON), 2) Section 1122, 3) rate review and 4) utilization review. Twelve dichotomously specified variables are used to capture these four regulatory areas. The final RI index is a scaler, interval measure derived from factor analysis and ordinary least squares regression. Per capita income (1980) measures the economic resources of the country. Local economic trends impact the demand for hospital services and the rates for reimbursement for medical

services. Hospital competition is measured as the number of hospitals within a 15 mile geographic radius of the focal hospital and reflects the extent of hospital competition for physician services (Luft and Merki, 1985; Robinson and Luft, 1988; Joskov, 1980). Finally, local RN supply is measured as the ratio of the number of registered nurses per hospital bed in the local country. The variable names, definitions, means and standard deviations are found in Table 1.

RESULTS

Zero order correlations between the measures of staffing and the organization and environmental characteristics were examined first to determine whether multicollinearity existed between the independent variables. Larger organizations and hospitals with residency training programs were more likely to use richer skill mixes of nurses as well as temporary agency nurses, but less likely to use part-time nurses. Voluntary not-for-profit hospitals were more likely to staff using higher ratios of registered nurses while the opposite relationship was found for government hospitals. Hospitals with a high acuity staffed with a high ratio of RNs, and made greater use of nurse registries Finally, higher wages for new RNs was associated with a higher ratio of RNs to total nursing staff, and greater use of contract nurse. Hospitals with greater length of stay tended to use more experienced nurses, but were less likely to use nurse rich skill mixes and part-time staff.

A number of significant associations between environmental characteristics and staffing patterns were also found. Different staffing patterns were found in the South and the Northeast. In the South, low ratios of RNs were likely to be found while high ratios were more frequent in the

Northeast. Part-time staff were also less likely to be used in the South than in the Northcentral states. Hospitals in urban areas were more likely to staff with high ratios of RNs, use temporary agency nursing staff and less likely to use part-time staff. Hospitals in counties with a high per capita income, with greater hospital competition, a large supply of registered nurses tended to use high ratios of RNs to total nursing staff and to use temporary agencies rather than part-time nurses. Hospitals in states with stringent regulatory polices were likely to use high ratios of RNs and also had high ratios of part-time nurses. Perhaps reflecting a supply induced effect was the high correlation between the supply of nurses in the county and the use of staffing patterns with a high ratio of RNs to total nursing staff.

Multivariate Analysis

There was little evidence of collinearity among independent staffing variables. To assess the simultaneous effects of the independent variables, we specified an ordinary least squares regression model in which all variables (staffing, hospital and environmental factors) were entered simultaneously. Two separate regression equations were specified. The first employed personnel costs as the dependent variable and the second non-personnel operating costs. The model in which personnel costs (the log of payroll and benefits per adjusted admission) was regressed on the independent variables, was highly significant ($F = 65.33$; $df = 21/561$; $p = 0.0001$) and explained 70% of the variance (Table 3). Consistent with Hypothesis 1, the use of part-time staff was related to lower personnel costs ($T = -3.42$; $p < 0.01$). In support of Hypothesis 3, hospitals that have a higher proportion of RNs who have more than 5 years of tenure also had lower pay and benefits costs per admission. Skill mix was unrelated to personnel costs. Five of the

organizational attributes had significant independent effects on personnel costs: for profit hospital (-); residency program (+); length of stay (+); acuity level (+); and average wages for newly hired nurses (+).

Environmental factors were also important predictors of personnel costs in the model. Hospitals in the South and West compared to the Northeast had lower personnel costs while those in urban SMSAs and in counties with greater per capita income had higher personnel costs.

As a final step, commonality analysis was performed to identify the independent contributions of the measures of staffing strategies in explaining hospital efficiency. The strategy of commonality analysis is based on separating the explained variance in efficiency into portions unique to staffing strategies and the set of control variables. The unique contribution of the staffing variables is the variance attributable to it when it is entered last into the regression model. It is represented as the squared semi-partial correlation between staffing patterns and hospital costs after partialing out the effects of the control variables (Kerlinger and Pehazur,1973). This analysis addresses commonalities of variable sets rather than individual measurement items and thus assess the contribution of the construct of staffing patterns.

The model predicting pay and benefits with only control variables had an adjusted R^2 = 0.6876. When the staffing variables were added, the adjusted R^2 =0.6989. Based on a partial F test, the independent contribution of the group of staffing variables for the model was significant at F =5.26 (df 4,561). Two staffing variables, percent of part-time RNs and percent of RNs with tenure greater than five years, had negative coefficients that were significant at <0.01 level.

Model 2, regressed the log of non-personnel operating costs/adjusted admission on the independent variables described earlier (Table 4). The total model was significant ($F = 34.79$; $df = 21/561$; $p = < 0.0001$), and explained 55% of the variance in operating costs. Consistent with Hypothesis 1, the use of part-time staff was associated with increased operating efficiency, (beta = -0.09, T = -2.44). Hypothesis 2 also received support. The greater use of temporary agency RN shifts per week, the greater the hospital operating costs (beta = 0.07; T = 2.37; $p < 0.05$). However, as in Model 1, the ratio of RNs to the total nursing staff (or skill mix) was not related significantly to hospital operating costs, thus failing to support Hypothesis 3a or 3b. The ratio of registered nurses to total nursing staff was not related to lower or higher operating costs. Consistent with Hypothesis 4, hospitals with a higher number of nurses with greater than five years tenure had significantly lower operating costs.

Four of the organizational variables had significant and positive independent effects on operating costs: presence of a residency program (+); longer length of stay (+); greater acuity of the patient mix (+); and higher wages for new hires (+). Two of the environmental variables had independent effects on the hospital's operating costs. Hospitals in urban areas and hospitals in service areas with more competition had higher costs.

The model predicting operating costs with only control variables had an adjusted $R^2 = 0.5201$. When the staffing variables were added the adjusted $R^2 = 0.5494$. Three of the variables were statistically significant at $p = 0.05$ level. The F test of the marginal contribution of the staffing variables was $F = 9.1$ (df 4,561), which was statistically significant. Again, percent of part-time nurses and percent of RNs with tenure greater than five

years had negative coefficients; whereas, the number of RN shifts covered by registry personnel in the last week had a positive coefficient.

The results for both models are consistent: 1) Use of part-time staff and the use of more experienced staff were related to lower personnel and benefit costs and to lower operating costs; 2) Use of agency nurses was related to higher operating costs; and 3) Skill mix of the staff was unrelated to either payroll costs or total non-personnel operating costs. The statistical significance of the control variables, however, differed in their effect between the two models of hospital costs. Private ownership of the hospital was related to lower payroll costs when compared to not-for-profit hospitals but was unrelated to operating costs. Hospitals in counties with higher per capita income have higher payroll costs while ones in the South and West had lower payroll costs than hospitals in the reference area of the North East. Total operating costs were higher in areas where there was greater hospital competition.

DISCUSSION

A potential limitation of this study is the age of the data set. The data reflect salary, economic features and organization structures prevalent a decade ago and may not reflect contemporary circumstances. Recent reports, however, do not appear to support this concern. The issue of wage compression and pay differentials as a function of experience and organization tenure are still major concerns. Further, recent reports suggest that do there is no reason to believe that the relationship between staffing strategies and hospital costs has changed. In other words, the situation today is remarkably similar to the one motivating the original Nurse Personnel Survey, the demand

for nursing personnel is greater than the current supply. This analysis speaks directly to a major recommendation of the Secretary's Commission on Nursing (1988) which encourages nurse employers "to use scare RN resources in an efficient and effective manner, there-by enhancing the adequacy of the existing RN supply."

The literature on hospital efficiency contains only a limited number of studies evaluating the effects of RN staffing strategies, and of those studies, the results are conflicting. This study's findings provides evidence that there is a significant relationship between types of RN staffing patterns and hospital costs. This relationship is found for both personnel and operating costs. Staffing patterns varied as to the use of temporary agency nurses, part-time career staff, degrees of nursing skill mix, and experience of hospital nursing staff.

Our research showed that the greater the proportion of part-time to full tim RNs on nursing staffs, the less the personnel and non-personnel operating costs. These findings suggest the importance of part-time staffing in meeting fluctuations in occupancy rates and variations in patient acuity, without forcing the hospital to resort to costly overtime. In addition, it points to the importance of staff orientation and knowledge of institutional norms, since the same relationship was not found with use of temporary agency personnel (registry). Further, the use of part-time career nursing staffs decrease the impact of intermittent nursing shortages by ensuring that part-time nurses remain in the nursing labor force.

Consistent with our expectations, the greater use of temporary agency RNs on hospital shifts was related to increased operating costs. This reflects the payment for registry staff in the operating budget. Although it

has been touted that hospitals using registry staff save four to five percent relative to regular career RN staff costs, no such cost saving in personnel costs was noted in our data. From these results, one can surmise that the additional advantages of using temporary agencies noted in the literature, such as a decreased managerial time needed to secure shift coverages or schedule a part-time pool, are small. Especially in relation to the lower productivity of registry staff due to their lack of organization-specific knowledge, such as, patient care policies and procedures and the location of equipment and supplies. In addition, because nursing practice is commonly conducted in teams with physicians and ancillary staff, team-based relationships involving external contract personnel potentially function less effectively. It is also likely that the agency nurses are being used to replace temporary vacancies due to illness and vacations rather than to vacancies in a budgeted position.

Our data indicate that skill mixes with higher percentages of registered nurses were not related to hospital costs. This finding is consistent with the analysis of twenty-two hospitals using the Medicus data that found no relation between high ratios of registered nurses and personnel costs (Glandon, Colbert and Thomasa, 1989). Our results extend this corpus of evidence to operating costs as well. Of all the staffing variables, skill mix had the least variability among hospitals in our sample and this may account for the lack of association with costs. This explanation would concur with the previous study results that found significant (both positive and negative) associations between nursing skill mix and costs when using unit level data, whereas the organizational level of study done by Medicus did not find such an association.

Although not a direct staffing strategy, the hospital's policy regarding retention and perhaps promotion from within the organization would lead to a greater number of the nursing staff having greater experience and tenure with the organization. We hypothesized that the greater the percent of experienced nurses, the lower the hospital costs. This relationship held for both personnel and operating costs. This finding is probably a result of several factors. The relationship with the lower personnel costs may well be due to the low wage ceiling of hospital positions for nurses, which ensures relatively low salary differentials between neophytes and experienced nurses. Increased personnel costs may reflect the use of incentive packages to recruit new graduates to the organization. Hospitals with more experienced nursing staff also were found to have lower operating costs. This may be explained in part by the relatively higher efficiency of experienced staff, based on greater productivity as well as less consumption of resources.

Staffing strategies have, in the past, been evaluated in regards to personnel costs for the production of a certain level or amount of patient care. Much of the research has focused on the cost-effectiveness of specific staffing strategies, such as the use of registry personnel or RN-rich staffs. Our study extends the evaluation of the impact of staffing strategies from personnel costs to the overall operating costs of providing a unit of hospital-based health care. Our findings indicate that staffing decisions have a significant impact not only on personnel costs, but operating costs of the hospital. On a practical level, findings on the relationship between RN staffing and organizational efficiency help management identify the optimal staffing patterns, specifically the use of part-time and experienced staff. These reflect important human resource utilization decisions, such as building

in flexible part-time scheduling and promotion from within the organization to retain nurses rather than looking to supply solutions external to the institution such as recruiting new full-time personnel or using RN temporary agencies.

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TABLE 1
Means, Standard Deviations, and Definitions of Variables
(N = 583)

Variable Name	Measure	Mean	S.D.
Staffing Variables			
1. Part-time Ratio	Ratio of Part-time RNs to Full-time RNs	0.34	0.19
2. Use of Temporary RNs	Number of RN Temporary Shifts per Week	9.42	26.74
3. Skill Mix	Ratio of Full-time RNs to Other Nursing Staff	0.45	0.17
4. RN Tenure	Percent RN Staff with > 5 years Teunure	34.53	20.25
Internal Hospital Characteristics			
5. Organization Size	Total Number of Beds Set-up/Hospital	194.58	180.70
6. Hospital Ownership	Church	0.14	0.35
	For Profit	0.09	0.28
	Not-for-Profit (reference)	0.53	0.50
	Government	0.24	0.43
7. Teaching Hospital	Existence of a Medical Residency Program	0.19	0.39
8. Average Occupancy Rate	Mean Occupancy Rate of Hospitals in Service Area	0.71	0.15
9. Length of Stay	Average Length of Hospitalization	10.49	17.65
10. Case Mix	Case Mix Index/Hospital	0.99	0.19
11. Wages for New RNs	Average Hourly Wage for Three Types of New Grads	7.40	0.86
Environmental Characteristics			
12. Region of Country	South	0.32	0.47
	West	0.12	0.32
	North Central	0.30	0.46
	Northeast (reference)	0.26	0.44
13. Urban	Location in Urban SMSA	0.58	0.49
14. Regulatory Intensity	Regulatory Intensity Index/State	0.18	0.95
15. Per Capital Income	1980 Per Capital Income/ County	8971.42	1972.67
16. Hospital Competition	No. of Neighbors in 15 mi.	10.89	17.75
17. RN Supply	RNs County/Hospital Beds	0.50	0.21
Outcomes			
18. Operating Costs	Log of Operating Costs/ Adjusted Admission	2.82	0.27
19. Personnel Costs	Log of Payroll & Benefits/ Adjusted Admission	2.94	0.27

TABLE 2
Inter-Correlations Between Measures of Staffing
with Organizational and Environmental Characteristics

	Part-time Ratio	Use of Temporary RNs	Skill Mix	RN Tenure
Organizational Characteristics				
Organizational Size	-0.26	0.33	0.31	-0.002
Hospital Ownership				
Church	0.05	0.05	0.07	0.03
For Profit	-0.10	0.02	-0.05	-0.11
Not-for-Profit	0.12	0.03	0.18	0.03
Government	-0.11	-0.08	-0.23	0.01
Teaching Status	-0.15	0.30	0.32	-0.04
Average Occupancy Rate	-0.19	0.16	0.27	-0.01
Length of Stay	-0.13	-0.04	-0.15	0.14
Case Mix	0.03	0.20	0.21	-0.03
Wages for New RN's	-0.004	0.21	0.21	-0.10
Environmental Characteristics				
Region of Country				
South	-0.42	-0.04	-0.30	-0.16
West	0.13	0.08	0.13	-0.13
North Central	0.41	-0.04	-0.04	0.18
Northeast	0.07	0.02	0.27	0.08
Urban	-0.12	0.23	0.41	-0.10
Regulatory Intensity	0.21	0.06	0.32	0.13
Per Capita Income	0.08	0.25	0.42	-0.07
Hospital Competition	-0.13	0.29	0.31	-0.10
RN Supply	-0.01	0.19	0.57	-0.07
Outcomes				
Operating Costs	-0.21	0.23	0.22	-0.14
Personnel Costs	-0.17	0.19	0.22	-0.02

TABLE 3
The Effect of Staffing Strategies, Organization and Environment Characteristics On Personnel Costs (N = 583)
(Pay and Benefits/Adjusted Admission)

Variable Name	B	S.E.	Beta	T-Value
Staffing Strategies				
1. Part-time Ratio	-0.14	0.04	-0.10	-3.42***
2. Use of Temporary RNs	0.0003	0.0002	0.04	1.38
3. Skill Mix	0.03	0.05	0.02	0.58
4. RN Tenure	-0.001	0.0003	-0.07	-3.06**
Internal Hospital Characteristics				
5. Organization Size	0.00003	0.00005	0.02	0.65
6. Hospital Ownership				
Church	0.01	0.02	0.02	0.69
For Profit	-0.09	0.03	-0.09	-3.47***
Government	-0.02	0.02	-0.03	-0.96
7. Teaching Status	0.08	0.02	0.11	3.77***
8. Average Occupancy Rate	-0.05	0.05	-0.03	-1.08
9. Length of Stay	0.01	0.04	0.60	21.35***
10. Case Mix	0.07	0.04	0.05	1.96*
11. Wages for New RNs	0.03	0.01	0.19	3.07**
Environmental Characteristics				
12. Region of Country				
South	-0.08	0.03	-0.14	-2.97**
West	-0.07	0.03	-0.08	-2.36*
North Central	-0.04	0.02	-0.09	-1.88
13. Urban	0.08	0.02	0.14	4.36***
14. Regulatory Intensity	0.01	0.01	0.03	0.91
15. Per Capital Income	0.00001	0.00	0.13	3.55***
16. Hospital Competition	0.0003	0.0004	0.02	0.74
17. RN Supply	0.07	0.05	0.05	1.39
Intercept	2.46	0.09	- - -	27.65***

Adjusted R^2 = 0.70; df = 21.561; F = 65.33; p < 0.0001

*** p < 0.0001
** p < 0.01
* p < 0.05

TABLE 4
The Effect of Staffing Strategies, Organizational, and Environmental Characteristics on Hospital Operating Costs
(N = 583)

Variable Name	B	S.E.	Beta	T-Value
Staffing Strategies				
1. Part-time Ratio	-0.11	0.04	-0.09	-2.44**
2. Use of Temporary RNs	0.0007	0.0002	0.07	2.37*
3. Skill Mix	0.07	0.05	0.05	1.26
4. RN Tenure	-0.002	0.0003	-0.14	-4.75**
Internal Hospital Characteristics				
5. Organization Size	-0.0001	0.00005	-0.05	-1.12
6. Hospital Ownership				
Church	-0.04	0.02	-0.007	-0.22
For Profit	0.02	0.03	0.03	0.91
Government	-0.03	0.02	-0.06	-1.79
7. Teaching Status	0.04	0.02	0.07	2.05*
8. Average Occupancy Rate	-0.07	0.05	-0.04	-1.24
9. Length of Stay	0.01	0.0004	0.55	15.84***
10. Case Mix	0.13	0.04	0.10	3.26***
11. Wages for New RNs	0.03	0.01	0.11	3.04**
Environmental Characteristics				
12. Region of Country				
South	-0.02	0.03	-0.03	-0.61
West	-0.05	0.03	-0.06	-1.55
North Central	-0.03	0.02	-0.06	-1.28
13. Urban	0.09	0.02	0.19	4.78***
14. Regulatory Intensity	-0.03	0.01	-0.01	-0.25
15. Per Capital Income	0.000008	0.00005	-0.07	1.58
16. Hospital Competition	0.001	0.0004	0.08	2.16*
16. RN Supply	0.05	0.05	0.05	1.00
Intercept	2.37	0.10	---	24.79***

Adjusted R^2 = 0.55; df = 21/561; F = 34.79

*** p < 0.001
** p < 0.01
* P < 0.05