



Supplemental Nurse Staffing in Hospitals and Quality of Care

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Objective: To promote evidence-based decision making regarding hospital staffing, the authors examined the characteristics of supplemental nurses, as well as the relationship of supplemental staff to nurse outcomes and adverse events.

Background: The use of supplemental nurses to bolster permanent nursing staff in hospitals is widespread but controversial. Quality concerns have been raised regarding the use of supplemental staff.

Methods: Data from the 2000 National Sample Survey of Registered Nurses were used to determine whether the qualifications of supplemental nurses working in hospitals differed from permanent staff nurses. Data from Pennsylvania nurse surveys were analyzed to examine whether nurse outcomes and adverse events differed in hospitals with varying proportions of nonpermanent nurses.

Results: Temporary nurses have qualifications similar to permanent staff nurses. Deficits in patient care environments in hospitals employing more temporary nurses explain the association between poorer quality and temporary nurses.

Conclusion: Negative perceptions of temporary nurses may be unfounded.

The adequacy of hospital nurse staffing, particularly in the face of increasing patient acuity in US

hospitals, is a contentious issue that has produced stakeholder debates about quality of care and patient safety. Concerns about staffing have led to political action, including mandated nurse staffing legislation in California.¹ Within this debate about appropriate staffing, the use of supplemental or temporary nurses to bolster short-term nurse staffing levels is widely viewed in negative terms.² Temporary nurses include those employed by external agencies, internal hospital per diem pools, and permanently employed nurses "floated" from their permanent units.

Several concerns regarding supplemental staffing are typically raised. Nurse executives and managers often seek to reduce the expenses associated with supplemental staff, particularly nurses brought in from outside agencies. Resentment sometimes accompanies a perception on the part of some permanent nurses that supplemental nurses (especially agency nurses) are paid at higher rates, despite being less efficient and needing support from permanent staff. (Pay differentials may or may not exist, depending on the type of supplemental staff and whether benefits paid to permanent nurses are taken into account.) A variety of stakeholders raise safety concerns relating to the use of supplemental staff, citing the potential for less familiarity with hospital and unit procedures and practices and disruptions in continuity of care and team communication as specific risks.³ In the Hospital Survey on Patient Safety Culture supported by the Agency for Healthcare Quality and Research, 67% of staff surveyed felt their units used more agency/temporary staff than what was best for patient care.⁴

Despite negative perceptions regarding temporary staff, realities force nearly all hospitals on at least some occasions to "float" staff nurses who are

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not permanent staff to some or all of their units, and most hospitals also use supplemental agency nurses. The American Hospital Association reported that 56% of hospitals used agency per diem or traveling nurses in 2001.⁵ More recently, the Community Tracking Study found that 75% of participating hospitals used supplemental nurses.² Recent estimates are that per diem (or local) agencies have approximately two thirds of the US \$6 billion annual market for externally contracted nurse services, with traveling nurse services accounting for the other third.⁶

There is little empirical evidence that the use of temporary nurses has adverse consequences. An association between use of nonpermanent nurses and adverse events, including infections, medication errors, and needlestick injuries to nurses, has been documented in a small number of studies.⁷⁻⁹ However, an important limitation of research on supplemental staffing is the failure to consider alternative explanations for associations identified, which is particularly important because hospitals that use more temporary nurses likely have other problems that account for poor outcomes.

Closer examination of whether the use of supplemental nurses heightens risks for adverse events is warranted, especially because much research documents that higher staffing levels at the bedside are associated with lower rates of accidents, patient complications, and preventable patient mortality.¹⁰⁻¹² For patient outcomes to be worse with supplemental nurses, nurses in supplemental staffing roles would have to be less qualified than permanently employed nurses, poorly oriented to hospital procedures, and inadequately briefed about their assigned patients. Yet, because more than half of bedside nurses work only 3 to 4 days a week because of the trend to 12-hour shifts,¹³ continuity of patient care assignments is not ideal regardless of the use of temporary nurses. Communication problems associated with shift changes and provider handoffs among nurses are commonplace.^{14,15} All of these issues affect care provided by permanent and temporary staff alike.

Methods

We used 2 data sources to explore the outcomes of supplemental nurse staffing. The 2000 National Sample Survey of Registered Nurses (NSSRN) was used to estimate the numbers of nurses in acute care hospital staff nurse roles employed by supplemental staffing agencies and whether their qualifications differed from permanent staff nurses.^{14,15}

Data from a unique survey of registered nurses (RNs) in Pennsylvania were also analyzed to examine whether nurse outcomes (job satisfaction, burnout, and intentions to leave their current job) and adverse events (ie, medication errors, nosocomial infections, and patient falls) differed in hospitals with varying proportions of nonpermanent nurses.^{10,16}

Samples

The NSSRN is a national probability survey sample of RNs licensed in each state.¹⁷ The response rate in 2000 was 72%. In this analysis, staff nurses employed by hospitals were compared with supplemental nurses employed by agencies external to the hospital. The final sample included 10,443 permanent hospital staff nurses and 695 hospital RNs working for supplemental staffing firms.

A second set of analyses involved a statewide survey of RNs in Pennsylvania in 1999, where a random 50% sample of RNs residing and licensed in the state received mailed questionnaires. The response rate for this survey was 52%. Respondents provided the names of their employing hospitals and answered questions about their practice environments, job satisfaction, and quality of care. They also provided information on how frequently certain adverse events occurred involving them and/or their patients. The American Hospital Association and Pennsylvania Annual Hospital Questionnaire databases for 1999 provided information on hospital characteristics used as control variables in the analyses.^{18,19} The responses of 13,152 nurses working in 198 adult acute care hospitals were analyzed.

Hospital Measures

In the Pennsylvania survey, nurses in each hospital reported the number of RNs on duty on their last shifts, as well as how many of the RNs were not permanently assigned to their units (ie, were either temporary or float nurses). Hospital-level percentages of supplemental/float (nonpermanent) nurses were averaged across all nurses in each facility.

The sufficiency of staffing and other resources in each hospital was measured using the Staffing-Resource Adequacy subscale (4 items) of the Practice Environment Scale of the Nursing Work Index, a nursing-sensitive measure adopted by the National Quality Forum.^{20,21} Nurses indicated the extent to which staffing/resource elements (enough staff, enough support staff, enough RNs, and sufficient time to discuss patient care issues with other nurses) were present in their hospitals, each on a scale from 1 to 4. A score for each hospital was

calculated by averaging ratings across all nurses working in the same hospital. This hospital-level measure was used as a control variable in regression analyses described below.

The American Hospital Association and Pennsylvania Annual Hospital Questionnaire databases for 1999 were used to determine teaching status (defined as on-site postgraduate training of residents and fellows), high-technology status (ie, whether there were facilities for solid organ transplants and/or open heart surgery), and size (≤ 100 beds, 101-250 beds, and >250 beds) of these hospitals.

Nurse Measures

Several nurse job outcomes were analyzed from the Pennsylvania data. Nurses rated their satisfaction with their current jobs on a 4-point scale ranging from "very dissatisfied" to "very satisfied" and indicated their intentions to leave their job within the next year. Also analyzed were nurses' scores on the 9-item emotional exhaustion subscale of the Maslach Burnout Inventory, on which respondents reported the frequency of feelings of being worn out physically and psychologically on a scale from 0 to 6. On the basis of norms for healthcare workers in the United States, scores of 27 and higher on this subscale were considered to indicate high burnout.²²

Nurses in the Pennsylvania survey also provided information about the safety and quality of care in their facilities by reporting the frequency of various negative events involving themselves or their patients in the last year on a 4-point scale ranging from "never" to "frequently." These events included (1) patients receiving the wrong medication or dose, (2) nosocomial infections, (3) patient/family complaints, (4) patient falls, (5) work injuries to staff, and (6) verbal abuse of nurses.

To account for possible influences of demographic characteristics, job title, and clinical specialty on nurse reports, a number of control variables were included in our analyses. These included gender, years worked at their current hospital, and whether nurses held a position with the job title "staff nurse." Clinical specialty was controlled by including dummy variables contrasting nurses on medical-surgical units with nurses on intensive care units, in perioperative settings, and from other specialties.

Data Analysis

Using the NSSRN data, hospital nurses in permanent positions were compared with supplemental nurses on age, gender, marital status, race/ethnicity,

education, and time since graduation from basic nursing education. The types of hospital units where the nurses (intensive care units vs others) spent most of their time were also compared across the 2 groups.

The 198 hospitals in the Pennsylvania study were divided into 3 categories: those where less than 5% of RN staff were reported to be nonpermanent nurses, those with between 5% and 15% nonpermanent nurses, and those where more than 15% of the RNs were nonpermanent. To assess whether the use of nonpermanent RNs varied across different types of hospitals, hospital structural characteristics (teaching status, size, and high technology) and resource adequacy ratings were compared across the 3 groups of hospitals. The significance of the differences was tested using χ^2 tests and F tests (for the Staffing-Resource Adequacy scores).

Associations between the levels of nonpermanent nurses in the hospitals (the independent variable) and the nurse outcomes and nurse reports of adverse events (the dependent variables) were examined using χ^2 tests. Logistic regression models were fit to re-estimate the effect of the percentage of nonpermanent nurses in the hospital (as a continuous independent variable) on these nurse outcomes and adverse event reports after controlling for potential confounding variables. A first set of models also entered all the nurse characteristic control variables (staff nurse job title, male gender, years of experience, and specialty) as a block. A second set of models adjusted for all the aforementioned factors as well as each hospital's Staffing-Resource Adequacy rating. The second set of models was tested to determine whether the adequacy of resources in different hospitals accounted for differences in nurse or patient outcomes that might otherwise be attributed to the use of supplemental nurses. Logistic regression models with robust standard errors were used to account for the clustering of nurses within hospitals.^{23,24} These models were estimated using Stata 9.1 (College Station, Texas), using a significance level of $P < .05$.

Results

Differences Between Permanent and Supplemental Nurses Nationally

Based on NSSRN data, an estimated 49,819 hospital staff nurses were employed by supplemental staffing agencies as either their primary or secondary position across the nation in 2000 (Table 1). This represents almost 6% of hospital staff nurses.

Table 1. Demographic Characteristics of Hospital Staff Nurses With Permanent Versus Supplemental Staffing Agency Positions*

Demographic Characteristics	Permanent Position	Supplemental Position	P value
Weighted sample size, n (%)	799,218 (94.1)	49,819 (5.9)	
Age, %			
<35 y	30.6	34.5	.19
35-44 y	34.7	35.1	
>44 y	34.7	30.4	
Gender, %			
Female	93.6	87.2	<.001
Male	6.4	12.8	
Marital status, %			
Married	71.5	52.6	<.001
Widowed, divorced, separated	15.0	27.0	
Never married	13.5	20.4	
Race/ethnicity, %			
White (not Hispanic)	85.5	76.1	<.001
Black (not Hispanic)	5.8	3.7	
American Indian/Alaskan	0.5	0.8	
Asian/Pacific Islander	4.7	15.2	
Hispanic	2.2	1.7	
Multirace	1.3	2.5	
Highest education in nursing, %			
Diploma	18.6	15.4	.007
Associate degree	41.9	39.1	
Baccalaureate	37.1	40.6	
Master's degree or doctoral	2.4	4.9	
Years since basic education, %			
≤5 y	31.0	35.5	.02
6-10 y	16.7	21.6	
11-15 y	14.6	12.9	
16-25 y	23.8	21.4	
≥26 y	13.9	8.5	

P values reflect the significance of χ^2 tests of independence.
*Authors' analysis of 2000 NSSRN data.

For most supplemental nurses (56%), their employment in supplemental staffing was secondary to a principal job as a hospital staff nurse. Although supplemental staff nurses were similar to permanent staff nurses with respect to age, they were about twice as likely to be male (13% vs 6%) and decidedly less likely to be married (53% vs 72%). Supplemental nurses were also less likely than permanent hospital nurses to be white (76% vs 86%) and more likely to be Asian (15% vs 5%).

Supplemental nurses were more likely than permanent nurses to hold baccalaureate or higher degrees (46% vs 40%) and more likely to have received their education in the last 10 years (57% vs 48%). In terms of the type of units where they spent most of their time, 35% of nurses holding supplemental positions worked in intensive care units, compared with 20% of nurses working in permanent positions.

Associations Between Proportions of Nonpermanent Nurses and Hospital Outcomes

Across the 198 hospitals in the 1999 Pennsylvania survey, the percentage of supplemental/float nurses providing direct patient care ranged from 0% to 32.7%. The percentage of temporary nurses was less than 5% in 61 (or 31%) of the 198 hospitals, between 5% and 15% in 109 (or 55%) of the hospitals, and more than 15% in the remaining 28 (or 14%). As Table 2 shows, hospitals that employed larger percentages of temporary nurses did not differ significantly from those that employed smaller percentages of temporary nurses with respect to teaching status, size, and technology. However, hospitals with the highest proportions of supplemental/float had significantly lower Staffing-Resource Adequacy scores.

Table 3 shows that before controlling for nurse or hospital characteristics, nurses in hospitals with 15% or more nonpermanent RNs were more likely to be dissatisfied with their jobs. They were also more likely to have plans to leave their current positions within a year and to show scores on burnout above the norm for healthcare workers. Some of the adverse events were also more commonly reported by nurses in hospitals with more nonpermanent staff nurses. Fewer nurses reported that nosocomial infections occur occasionally or frequently in hospitals where less than 5% of nurses were nonpermanent, and the percentage who reported frequent work-related injuries was significantly higher in hospitals that employed more than 15% nonpermanent nurses. Patient falls and verbal abuse were least commonly reported by nurses in hospitals in the middle category (5%-15% nonpermanent nurses). Reports of medication errors and patient or family complaints were no higher in hospitals with more nonpermanent nurses.

The results in Table 3 might suggest that employing higher proportions of nonpermanent nurses has negative impacts on permanent nurses and negative or mixed effects on adverse events. However, as shown in Table 2, more nonpermanent

Table 2. Characteristics of the Sample of Pennsylvania Hospitals Overall and by Proportion of Nonpermanent Nurses*

Hospital Characteristics	All (n = 198)	Proportion of Supplemental/Float Nurses			P value
		<5% n = 61	5%–15% n = 109	>15% n = 28	
Teaching hospitals, %	37.5	32.0	39.6	40.0	.637
Hospital size, %					
Small (≤100 beds)	23.3	22.0	20.8	36.0	.194
Medium (101–250 beds)	56.3	64.0	53.5	52.0	
Large (>250 beds)	20.4	14.0	25.7	12.0	
High-technology hospitals, %	29.0	22.0	33.7	24.0	.278
Resource adequacy, mean (SD)	2.20 (.28)	2.28 (0.26) ^a	2.21 (0.25) ^a	1.98 (0.29) ^b	<.001

P values reflect the significance of the difference in percentages across the 3 supplemental/float nurse categories generally. Percentages in the same rows that share the same letter are not significantly different at $P < .05$.

*Authors' analysis of data from the 1999 Pennsylvania Hospital Outcomes Study.

nurses were employed in hospitals where staffing and other resources were lower. This suggests a need to take resource adequacy into account in evaluating the impact of nonpermanent nurses on outcomes. Table 4 shows odds ratios that express the effect of having more nonpermanent nurses on the 3 nurse outcomes and 6 adverse events after controlling for nurse characteristics and then after controlling additionally for Staffing-Resource Adequacy scores.

Table 4 shows that the association of nonpermanent staffing with the nurse outcomes remains significant, or nearly so (in the case of high burnout), when nurse characteristics are controlled. When Staffing-Resource Adequacy is taken into account, however, nurses in hospitals

with more nonpermanent nurses are no more likely to be dissatisfied with their jobs than nurses in hospitals with fewer, and nurses in the former hospitals are in fact significantly less likely to be burned out. [In the case of all of the variables reported in Table 4, odds ratios less than 1 indicate that higher levels of supplemental staff were associated with lower likelihood of these negative outcomes. Where these associations are statistically significant, they suggest that better outcomes were associated with higher percentages of supplemental staff, after the relevant percentages.] Similarly, other entries in Table 4 show that after taking account of differences in the adequacy of staffing and resources, nurses in hospitals with higher levels of nonpermanent staff were no more likely to report

Table 3. Nurse Outcomes and Nurse-Reported Patient Outcomes, by the Proportion of Nonpermanent Nurses in Hospitals*

	Proportion of Supplemental/Float nurses			P value
	<5%	5%–15%	>15%	
Nurse outcomes				
Dissatisfied with job	41.12 ^a	40.27 ^a	46.08 ^c	.001
Plans to leave within 1 y	19.68 ^a	22.96 ^b	29.70 ^c	<.001
High burnout	44.42 ^a	42.23 ^b	47.95 ^c	<.001
Nurse-reported patient outcomes				
Wrong medication	16.08 ^a	15.42 ^a	15.05 ^a	.601
Nosocomial infection	32.27 ^a	35.71 ^b	34.29 ^{a,b}	.002
Complaints from patients/families	48.28 ^a	49.04 ^a	51.32 ^a	.197
Patient falls	21.60 ^a	19.60 ^b	22.43 ^a	.01
Work-related injury	32.27 ^a	32.93 ^a	37.06 ^c	.008
Verbal abuse directed toward nurses	54.48 ^a	51.58 ^b	55.58 ^a	.002

P values reflect the significance of the difference in percentages across the 3 supplemental/float nurse categories generally. Percentages in the same rows that share the same letter are not significantly different at $P < .05$.

*Authors' analysis of data from the 1999 Pennsylvania Hospital Outcomes Study.

Table 4. Associations of Nurse Outcomes and Nurse-Reported Patient Outcomes With the Proportion of Nonpermanent Nurses, Before and After Adjustment*

	Adjusted for Nurse Characteristics		Adjusted for Nurse Characteristics and Staffing-Resource Adequacy	
	OR (95% CI)	P value	OR (95% CI)	P value
Nurse outcomes				
Dissatisfaction with job	1.19 (1.07-1.33)	.001	1.00 (0.92-1.09)	.94
Plans to leave job within 1 y	1.39 (1.24-1.57)	<.001	1.28 (1.14-1.42)	<.001
High burnout	1.10 (0.98-1.23)	.10	0.91 (0.83-0.99)	.03
Nurse-reported patient outcomes				
Wrong medication	0.92 (0.82-1.04)	.18	0.82 (0.74-0.92)	<.001
Nosocomial infection	1.08 (0.94-1.24)	.25	0.99 (0.86-1.13)	.84
Complaints from patients/families	1.05 (0.95-1.15)	.34	0.91 (0.84-0.99)	.04
Patient falls	1.06 (0.89-1.26)	.51	0.89 (0.76-1.05)	.16
Work-related injuries	1.16 (1.04-1.29)	.008	1.01 (0.91-1.14)	.75
Verbal abuse directed toward nurses	1.02 (0.92-1.13)	.68	0.90 (0.82-0.99)	.03

Abbreviations: OR, odds ratio; CI, confidence interval.

The odds ratios represent the increase (when >1.0) or decrease (when <1.0) in the odds of nurses reporting the outcome with each 10% increase in the proportion of nonpermanent nurses. They were estimated using logistic regression models with robust standard errors.

*Analysis of 1999 Pennsylvania Hospital Outcomes Study data.

higher levels of adverse events and were in fact less likely to report high frequencies of wrong medications, complaints, and verbal abuse. Intent to leave among nurses was the only negative outcome examined that appeared to be significantly more likely in hospitals with more nonpermanent staff, both before and after controlling for background variables.

Discussion

Supplemental nurses are a small but nontrivial group of RNs in hospitals. A high proportion of supplemental nurses works in critical care units, where the need for nurses with specialized skills is high. The analyses provided no indication that supplemental nurses were less qualified than permanent staff nurses; supplemental nurses were more likely to hold baccalaureate and higher degrees and were as experienced as permanent nurses. This is not altogether surprising, because supplemental nurses and staff nurses are not distinctly different groups. More than half of the supplemental nurses reported that their temporary nursing position was secondary to a primary job as a hospital staff nurse.

The Pennsylvania data analyzed here did not suggest that higher use of nonpermanent nurses caused safety and quality problems for nurses or their patients, nor that higher levels of nonpermanent nurses were linked to poor job satisfaction among permanent nurses. Rather, it was observed

that more nonpermanent nurses were found in hospitals where staffing and the adequacy of other resources were rated lower, which seems logical because temporary nurses are brought in explicitly to compensate for shortfalls of permanent staff. Higher levels of nonpermanent nurses were not associated with events suggestive of quality problems in hospitals. After controlling for adequacy of staffing and resources, higher levels of nonpermanent staff were actually associated with lower levels of such events, suggesting that resource adequacy is the deeper underlying problem and that nonpermanent or supplemental nurses may mitigate or compensate for nurse staffing deficiencies. Especially with forecasts of a deepening shortage in the coming decades, judicious use of supplemental staff is likely to be one of several strategies that managers and executives will need to draw upon to ensure patient safety and quality care.

The data here indicating that having more supplemental nurses may, in some cases, have a positive impact on patient outcomes are consistent with a previous study that found better perioperative outcomes associated with the use of temporary nurses.²⁵ One exception was that permanent nurses in hospitals with higher proportions of nonpermanent nurses were more likely to indicate intentions to leave their jobs within a year, even after controlling for staffing and resource adequacy. Intent to leave can reflect both local labor market conditions (nurses who believe they have many job opportunities may express greater willingness to leave their positions, all things being equal), as well

as poor working conditions in specific hospitals. Consequently, this association may reflect common underlying causes of high use of temporary staff and weaker commitment of permanent nurses to their jobs rather than a negative impact of the temporary nurses themselves.

Several limitations should be noted. In our analysis of the characteristics of supplemental nurses, using the NSSRN, it was possible to identify nurses who worked in primary or secondary jobs for supplemental staffing firms. However, in the Pennsylvania hospital data, it was not possible to distinguish nonpermanent nurses employed by supplemental staffing companies from RN employees of the hospital who move or float to different units on a temporary basis. Also, in the Pennsylvania data set, the proportions of nonpermanent nurses were derived from nurses' reports of all personnel assigned to their unit on their last shift. Although subject to reporting biases, to our knowledge, survey data currently provide the only means for making direct comparisons across the hospitals in an entire state on both the staffing and the outcomes measures we selected.

In conclusion, national data suggest that nurses employed by supplemental staffing agencies are as well educated (perhaps even more so) and as experienced as permanent nurses in hospitals. Our analyses of nurse-reported outcomes in 198 hospitals in Pennsylvania do not suggest a negative impact of temporary nurses on quality of work life or quality of patient care. On the contrary, our findings are consistent with the body of literature showing that, across many time periods and different states and countries, higher levels of RNs in direct patient care, whether permanent or nonpermanent nurses, are associated with lower rates of patient adverse events. Thus, the assumption that the use of temporarily assigned RNs has an adverse impact on quality of care, although widely held, may be more of a myth than reality. Further research exploring the patient outcomes associated with different staffing approaches is warranted. Executives and managers in hospitals need options in the face of a deepening nurse shortage and should be offered more evidence (and less speculation and conjecture), for making rational staffing decisions.

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